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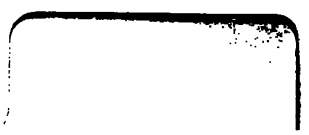

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Medicine an Aid to Commerce.

Being the Papers and Discussions Presented at the XL Annual Meeting of the American Academy of Medicine, held at San Francisco, June 25-28, 1915.

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FOREWORD.

The papers publisht in this volume were read at the fortieth annual session of the American Academy of Medicine held in San Francisco in June, 1915, and are reprinted from the *Journal of Sociologic Medicine* for the convenience of those who desire the papers groupt together and not scattered thru the pages of the *Journal*.

These conferences, held in connection with the successiv annual meetings of the Academy, illustrate the pervasiveness of medicine in our modern civilization and prophesy the coming physician to be a man of affairs, concerned in a professional way in the industries, arts, science and commerce in addition to his old and more restricted field of caring for the physical welfare of the individual.

The trend of society to-day from individualism towards socialism has made some apprehensiv of the future of the medical man, because by coöperativ methods of practice there will be a lessening of fees with a reduced income, consequently the necessity of a larger clientele for the individual physician with the result of fewer physicians, but the vista opened by papers such as are included in this volume and those publisht in the previous volumes of a similar nature, shows new fields for the service of the physician, amply compensating for the reduced demands upon his service as a healer of individuals, brought about by more efficient organization.

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THE PHYSICIAN AS A PIONEER.

By Woods Hutchinson, A.M., M.D., New York.

To the superstitious eye, it might appear significant that physician, pioneer and Panama all begin with the same letter. Certainly, if there had been no pioneer, there would have been no Panama Exposition, and if there had been no physician, there would have been no Panama Canal.

The real enemy of the pioneer, the chief obstacle to the spread of civilization is not Indians, or wolves, or rattlesnakes or even famine or flood—or winter cold, or tropic heat, but insects. Most schemes of colonization that have failed, failed not from famine, or the attack of enemies, but thru disease. And more than half of them from one disease—malaria.

The proper enemy of mankind is Bugs. And our inborn instinct to biff everything that flies, and crush everything that crawls, is of the soundest. This is not merely the age of man, but the age of insects, geologically considered, and the battle is to the death between them for the possession of the earth.

In the Tropics, the insects get the whip hand of man and keep him stupid, short-lived, uncivilized. It was the plague of flies, the bloody, tyranny of nsects, that drove man out of the warm, comfortable, fertile Tropics into the chilly, rain-swept, half-the-year frozen North. Here he can be rid of them and their pestilent attacks for half the year, except such few hardy species as follow him into his houses, and get a breathing spell to plan campaigns against them for the other half. Now grown to full human stature, flusht with his victory over the elements in winter and the insects in summer, he is coming back to invade and reconquer the Tropics and put to flight the ancient foes of the race.

Incidentally, it was probably this same pest of insects that drove the migratory birds into that strange and romantically adventurous habit of winging their weary way thousands of miles over valleys and mountains and a waste of seas without chart or compass every spring, right up to the Arctic Circle itself, in order to nest and rear their young in peace and safety. It is an interesting coincidence, to say the least, that these, our little

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brothers of the air, have become our strongest and most valuable allies in the fight against the common insect enemy, not only those pests that prey directly upon man, but those that attack him indirectly and with almost equal deadliness thru his fields and his crops.

Tho their co-operation has nothing romantic or altruistic about it, they save our crops merely to fill their own—yet we should at once form a dual alliance with them of the warmest and most perpetual kind. Some day, perhaps, poets may come to apostrofize and immortalize not so much the songs that birds sing, but the worms that they eat, their gorgings, instead of their warblings.

In an earlier day, the first requisite of a new colony, or a pioneering expedition, was a captain, a bold and skilful fighting man with muskets for every grown man in the party, and plenty of powder and ball. But now, the first and most fundamental requirement of a new colony is a doctor-engineer with microscope and test tubes, spades and trenching machines, and plenty of quinin, kerosen and mosquito-netting.

The beginning of successful white colonization of the Tropics dates from the discovery of quinin. Our own Mississippi Valley could never have been settled without it, and scores of colonies in our Middle West have been broken up and driven back east by the deadly "congestiv chill" or pernicious malaria, within the last century, just as the settlers at Jamestown were on the verge of being, twice, when they were reinforced by shiploads of new colonists—fresh food for mosquitoes.

In the near future, no colony or land company will be permitted to take settlers into their new homes, until a thoro and complete survey shall have been made of the region, sanitary, medical, entomological, expert agricultural. And at least a sufficient area to accommodate in safety the first group of settlers shall have been drained and kerosened and supplied with good water, so as to be protected against malaria, typhoid, hookworm and water- and fly-borne diarrhoea and dysentery.

In the light of our present knowledge, it should be regarded as little short of manslaughter to permit men, women and little children who are unfamiliar with the country, unseasoned to the climate, to enter and face the dangers of settlement in a new

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country or district without this preliminary survey and protection, whether in their own land or across the seas. It would cost a few thousands or hundreds of thousands of dollars, but not very much more than the advertising literature, and would save ten times its cost in human life and suffering and failure, besides being the best possible advertisement for the enterprise.

New countries can and ought to be made models of health, efficiency and comfort for the older communities, and could easily be made so at moderate expense, if the physician-pioneer be given a free hand in advance, as Gorgas was at Panama. Let the doctor go first and lay the foundation for a healthy, happy, disease-free community, and you will do more to insure the success of a new colony, whether at home or abroad, in the Tropics or in the temperate zone, than by any other single step. In fact we can pretty nearly assure success, if the soil be good and the water sufficient.

It must be remembered in fairness that bad as insects are, they do *not* originate the diseases they spread, but only carry them from one infected human being to other healthy ones. Deprive them of their source of infection, and they become comparatively harmless. If the new country be uninhabited or sparsely settled, it is easy to cure or isolate such cases of malaria or yellow fever, typhoid, summer diarrhoea or other disease carriable by insects. Then after a few weeks or at the outside months' waiting the infected insects will all be dead. Generally speaking, however, new settlers bring their diseases with them, and a most effectiv way of protecting a new settlement against not merely insect-borne, but all other communicable diseases, would be a thoro physical examination of all intending settlers and their families. This should include blood examinations for malaria, for syphilis, for typhoid carriers; and microscopic and smear-tests for diphtheria and pneumonia carriers and hookworm. If any such were discovered, a few weeks' isolation or appropriate treatment with quinin, salvarsan, thymol, etc., would be sufficient in the vast majority of cases to clear up all risk. Such examinations would be worth twice their cost to the individuals examined alone; and, in combination with a proper sanitary survey, would turn new countries and new colonies into little health-heavens on earth.

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THE PREVENTION OF ORIENTAL DISEASES.

By RUPERT BLUE, D.Sc., M.D., D.P.H., Surgeon-General, U. S. Public Health Service, Washington, D. C.

It is a basic fact of epidemiology that most of the communicable diseases of man are peculiar to the human species. Reasoning from this premise, it may be deduced that man is the disseminating agent of his own ailments, and that wherever he goes he carries in his own body the causativ agents of these maladies. Frequently a group or race acquire a certain immunity to their own infections, but when they migrate and implant them on the virgin soil of a non-immune population there occurs a markt exacerbation or even a fulminant epidemic outbreak.

The settlement of the United States has been from the east to the west and as the tide of immigration rolled from the Atlantic to the Pacific, it swept before it the aboriginal race and destroyed it, not wholly by reason of force of arms, but because of its non-immunity to the diseases of the whites. For many years there has been a steady immigration into the United States from East to West. In other words, there has been an oriental incursion. As a result the white inhabitant of the Pacific Coast has been exposed to a number of maladies to which he has neither an immunity or a tolerance.

Due cognizance of this fact has been taken by the United States Government. Every endeavor has been made thru the logical application of maritime quarantine and the physical examination of arriving alien immigrants to prevent the entrance of disease-bearing persons and things. It is a trite, but none the less true saying, that perfect results in the application of quarantine procedure cannot be obtained without disastrous hindrance to commerce and that the operation of maritime quarantine is merely the culling out of the larger and more apparent disease elements. Thru the physical examination of arriving aliens, it has been possible to remand persons having certain diseases which are difficult to cure and to hold and treat others before

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permitting them to land. Any addition to the already existing hookworm infection in the state has in this way largely been prevented. It should not be forgotten, however, that there are many infections, particularly those of animal parasitic origin, which cannot be detected by the routine examination of immigrants, and that should these infections once gain lodgment in the United States their eradication may be accomplisht only at the cost of much labor and money. Among these are filariasis and the various fluke infections, for example, clonorchis sinensis and the paragonimus westermani.

The danger of the introduction of cholera must also be borne in mind. While it is true that in the great majority of cases cholera carriers do not long harbor the infection, the possibility of their remaining infected as long as seventy-five days in extreme cases requires care lest cholera be introduced in this way. The rapid bacteriologic method which has been perfected by McLaughlin and Goldberger renders the diagnosis relatively easy and permits its being made without undue detention of the passengers. At the present time it is not necessary that this be applied as a routine measure, but should cholera become prevalent in oriental ports it would be necessary.

The danger of the introduction of plague is omnipresent and will so continue until rat-proof ships are in common use. On the Pacific Coast, particularly at San Francisco and Seattle, considerable activity has been displayed in the building of rat-proof buildings and wharves. This, of course, is an important measure for the prevention of human plague, and if carried to a logical conclusion will render our cities immune from pest.

It may be proper to mention here the danger of the introduction of trachoma from the Orient. This is practically controlled, however, by the examination of arriving aliens at the immigration stations. In this connection it should be recalled that the disease is already quite prevalent in many parts of the United States and that it has been necessary for the Federal Government to erect special hospitals for the control of the disease in certain districts.

While we already have a widespread uncinariasis in this

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country, we should not overlook the danger of agylostomiasis from the Orient. At the present time all arriving aliens presenting any symptoms of the disease are held for further medical examination. This has led the Japanese and Chinese Governments to take measures looking to the care of persons having hookworm prior to their embarkation. These measures have reduced considerably the amount of work which we have had to do on this coast.

Sprue is another infection which might be introduced into our country from the Orient. As a matter of fact, the disease has been reported in two or three portions of the United States already.

The recognition of these diseases must, therefore, rest upon the general practitioner. At the present time this is not an easy task. The reason for this lies in the fact that up to a few years ago, practically no instructions whatever were given in the medical schools upon the subject of tropical diseases. These were regarded entirely as exotic and it was thought that they could never gain a foothold on American soil. The investigations of the last few years, however, have shown that we really live in a sub-tropical climate and that those diseases which were formerly considered as confined to the tropics may find lodgment in almost every portion of this country.

Since these diseases exist, and since the first line of defense cannot accomplish perfectly the exclusion of such infections, it is logical to deduce that the second line of defense, that is, the general practitioner of medicine, must be strengthened. This can, to my mind, be best accomplisht by the institution of courses in tropical medicine in all medical colleges. These should be of two sorts. First, the general instruction to be given the undergraduate, the object of this course being to acquaint him with the general symptoms and science of tropical and sub-tropical diseases, so that he may realize the necessity for calling in expert aid in cases of doubtful diagnosis. Secondly, there should be post-graduate courses for those who desire to go further into the subject, or to adopt tropical medicine as a specialty. Such courses should include not only the didactic instruction in tropical

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medicine itself, but also bench work in helminthology, etiology and the various diseases of parasitic origin. This should be supplemented by work in the clinic and in the wards. And in locating such institutions, advantage should be taken of the availability of clinical material. New Orleans already has an institution which is carrying out work along these lines. It would seem to me that San Francisco, on account of its close oriental connections, is ideally situated for the foundation of another similar institution. If we can in this way equip and train a large number of physicians, we will have, in my opinion, the most practical weapon for the prevention of oriental diseases.

It should be borne in mind that the principles which underly the prevention of oriental diseases are practically the same as those which underly the prevention of the occidental diseases. Therefore, the public health awakening which is now occurring in our country will act in a considerable measure to prevent oriental diseases. With the improvement in the sanitary laws, with the employment of the full time health officers, with the public health education of the general public, there is bound to come a lessening of communicable diseases in general.

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THE CONTROL OF HOOKWORM DISEASE BY THE PACIFIC MAIL STEAMSHIP COMPANY.

By Herbert Gunn, M.D., San Francisco.

In 1910 it was demonstrated by Assistant Surgeon Glover of the United States Public Health Service that a very large percentage of the Hindus arriving at the Immigration Station at San Francisco were infected with hookworm. Observations among the Chinese and Japanese revealed a similar state of affairs.

Thru the untiring efforts of Dr. Glover, the capacity of the Immigration Hospital at Angel Island soon became taxt with hookworm cases, as the immigration authorities if not deporting a case, required that it be treated and cured before being landed at San Francisco. The detention sheds at the Immigration Station likewise became congested on account of the unusually large numbers being held for treatment.

In 1912 the United States authorities issued an order requiring a medical certificate showing freedom from hookworm disease at the time of embarkation in aliens coming from hookworm infected districts. This was accomplisht by including hookworm disease in a regulation which imposes a fine of $100.00 on any steamship company transporting to the United States an alien afflicted with a dangerous, loathsome or contagious disease, if a proper examination at the port of embarkation would have demonstrated the existence of that disease.

Following this order Chinese at Hong Kong were required to furnish the necessary medical certificate to the Steamship Company before being permitted to embark. This work of certification was soon confined to a small group of practitioners in Hong Kong, and it very soon assumed such enormous proportions that the establishment of a hospital for the treatment of those found infected became necessary. This plan workt fairly well for a time, but it was soon found that the number of infected persons arriving at Angel Island was steadily increasing, altho

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they all had the necessary Hong Kong certificates stating that they were free of the disease, or had been treated and cured. This state of affairs caused considerable dissatisfaction among the Chinese, for after going to considerable expense in Hong Kong for medical certificates and hospital treatment, they frequently had to repeat the procedure on arrival at San Francisco. Naturally this discouraged many from coming to the United States.

Early in 1913 the matter was brought to a focus by the immigration authorities, owing to the congestion at the Angel Island Hospital on account of the large number of hookworm cases, all holding certificates from the Hong Kong physicians stating that they were free from the disease. It was intimated that in future it would be impossible to permit the treatment of cases arriving here and that they would be deported.

Two methods of dealing with the situation presented themselves for consideration to the Steamship Company:

First. The establishment of a hospital to carry on the work in Hong Kong or vicinity.

Second. The examination of all cases in Hong Kong by a representativ of the Steamship Company and the treatment of those found infected by the ship surgeon while en route.

After discussing the matter with the immigration officials, the latter plan was determined upon.

After a thoro course of instruction, an experimental trip was made by Dr. Conrad Richter, who later was stationed in Hong Kong. Eleven cases were treated, all of which were cured before arrival and admitted by the immigration authorities.

Before being permitted to undertake the work, each surgeon from the seven ships of the Company was given a careful course of instruction in the laboratory methods of examination and in the treatment of cases. For the latter purpose a ward was retained in one of the hospitals in San Francisco, where hookworm cases were treated by the ship surgeon under the direction of the instructor.

Each ship was equipt with a microscope, electric centrifuge, and other necessary paraphernalia.

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Suitable arrangements were made for the isolation of patients while under treatment in order to lessen the liability of their obtaining food and drinks from other passengers.

In Hong Kong a thoroly equipt laboratory was establisht under the direction of Dr. Richter, who was assisted by the ship surgeons during their stay in that port.

The results of these examinations were recorded on certificates bearing fotografs of the aliens examined and were turned over to the ship surgeon. The most rigid precautions were taken to avoid errors or deceptions in obtaining the specimens for examinations, the stools being past in a room in the presence of an attendant. This was absolutely essential, as it was known that the Chinese had practised all sorts of deceptions in order to obtain a certificate.

In all cases past by the examining surgeon in Hong Kong as free from the disease, a small specimen of the stool preserved in formalin was forwarded to San Francisco to be examined should the case be found infected upon arrival at Angel Island.

The Steamship Company made no charge for the examination in Hong Kong, but a charge of $30.00 Mexican (about $13.50) was made for treatment aboard ship. This amount, which was considerably less than that charged by the Hong Kong physicians for treatment, was to cover the cost of treatment, salaries, fines paid the United States Government, and allowed a bonus of $5.00 gold to the surgeon for each case cured en route.

As soon as practicable after the Hong Kong examination, those examined were placed aboard ship, those infected with hookworm being placed in charge of the ship surgeon for treatment.

Weather conditions and port regulations necessitating inspection of the passengers had next to be taken into consideration in regulating the course of treatment.

In the beginning of the work, the orders were to give treatment two days in succession with a rest of three days following. Slight modifications, such as single day treatments and treatments of three days in succession, were found expedient on account of the

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ship's schedule. However, the interval of from two to four days between the courses of treatment was observed.

Thymol was used, the dose for an adult being 20 grains hourly for four doses, or 80 grains during the morning.

Castor oil oz. $1^1/_2$ was given the night preceding the course of treatment; and Epsom salts oz. 1 two hours before, and again one hour after, the administration of the thymol. Castor oil was repeated the night preceding the next course of treatment but was never given on a day during which thymol had been taken.

No food was taken on the day of treatment until two or three hours after the last dose of thymol, when a broth was given. This was repeated in a couple of hours, and in the evening full diet (consisting mostly of rice and fish) was allowed.

After two courses or four days' treatment, examination of the stool was made, those found cured being dismist from further treatment or given an additional course of two days.

In the uncured cases the courses of treatment and the re-examinations were continued until San Francisco was reacht.

In cases where the re-examinations had not been completed at the time the next treatment was due, the treatment was given.

In cases which took the thymol badly, in children, very old people, etc., the re-examinations were made immediately in order to give as little thymol as necessary.

It was soon found that the three days' interval between the treatments permitted only between seven and ten days' actual treatment, which was not sufficient to cure the intractable cases. Patients destined for Honolulu could receive no more than five or six days of treatment.

Furthermore, the immigration authorities objected to treatment being given between Honolulu and San Francisco on the grounds that the thymol inhibited the deposit of eggs, thereby necessitating a delay before examinations could be made at Angel Island.

In view of these facts, the treatment was modified as shown in the following extracts from the instructions given to ship surgeons:

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In view of the desirability of having all cases cured before arrival at Honolulu it is necessary to shorten the intervals between the treatments. Instead of waiting three days as heretofore before repeating the treatment, it may be repeated after a rest of one day. This will readily permit of two full courses of two days each being administered between Hong Kong and Yokohama and of three such courses between Yokohama and Honolulu, and in exceptional cases of two additional courses between Honolulu and San Francisco. The treatment should be started as soon after leaving Hong Kong as possible, immediately after leaving Yokohama and when necessary immediately after leaving Honolulu.

Re-examinations of stools should be commenced not later than with the beginning of the treatment on leaving Yokohama. Should there not be sufficient time for the surgeon to complete all stool examinations between courses of treatment the treatment should be given when due and the stool examined later. When the stool is found to be negativ for hookworm the patient is continued under treatment during the following course of two days, after which all treatment is discontinued. Four days later a re-examination of a fresh stool is made and the patient pronounced cured or treatment resumed as the case may be.

The finding of eggs in this final re-examination will almost invariably mean that they were overlookt when the stool was previously pronounced negativ, as contrary to the general belief, this treatment but rarely inhibits the deposit of eggs.

Cases which do not take treatment well should be given special attention and their re-examination made first in order to give them no more of the drug than is necessary.

Cases en route to Honolulu should be given every course of treatment, *i. e.*, five courses or ten days as there is not sufficient time to resume treatment should the final stool examination prove positiv; exception to this should be made, of course, if the drug were not well tolerated in which case they should be handled in the same manner as those en route to San Francisco.

The medication should be carried out exactly as in the past, *i. e.*, castor oil the evening preceding the course of treatment; salts before and after the thymol, and thymol gr. 20 hourly for four doses—or in all 80 grs.

In January, 1914, three months after the treatment had been instituted aboard ship, the immigration authorities began imposing a fine of $100.00 for every hookworm case that the Company had treated aboard ship and had failed to cure. This was accomplisht under the following regulation: "Any steamship company transporting to the United States an alien afflicted with a dangerous, loathsome or contagious disease, if a proper examination at the port of embarkation would have demonstrated its existence, is liable to a fine of $100.00."

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While it is true that up to this time the results of the Steamship Company in treating these cases were not perfectly satisfactory, yet the fact remains that the number of hookworm cases arriving at this port had been greatly reduced. Furthermore, there was every reason to believe that the Steamship Company's method of handling the cases would show better results as time went on.

However that may be, the Steamship Company was placed in the unique position of paying a fine if they failed to cure a case, or of discontinuing the work and allowing the Chinese to again be handled in Hong Kong, where conditions had previously proved so unsatisfactory. It was decided to continue the work and pay the fines.

In view of the fact that over 500 cases had been treated with no untoward results in any, the maximum dose of thymol was increast from 80 grains to 120 grains, 30 grains to be given hourly. This increast dosage was to be used only in the few cases remaining uncured after several courses of treatment had been given.

The following is an example of the treatment as carried out in an intractable case:

Leaving Hong Kong June 26th and arriving in San Francisco July 25th.

June 27	Thymol gr. 80.
June 28	Rest.
June 29, 30 and July 1	Thymol gr. 80 daily.
July 2 and 3	Rest.
July 4–5	Thymol gr. 80 daily.

On account of bad weather after Yokohama, no treatment until

July 10–12	Thymol gr. 90 daily.
July 13	Rest.
July 14, 15, 16, 17	Thymol gr. 100 daily.
July 18	Rest.
July 19, 20, 21, 22	Thymol gr. 120 daily.

A total of 1560 grains of thymol given on 16 days. Examination of the stools showed positiv until the morning of the last treatment.

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RESULTS OF TREATMENT.

Over 60 per cent. of all the Chinese examined in Hong Kong were found to harbor hookworm.

Total number of cases treated aboard ship, 1776.

Number not cured on arrival at San Francisco, 55 or 3 per cent., according to the Steamship Company's examinations of specimens secured after arrival of the ship in San Francisco and before disembarkation.

Additional specimens obtained by the ship surgeon at the final examination aboard ship, when the patient was pronounced cured, were preserved and kept for examination in the event that the patient was not pronounced cured by the immigration authorities.

Of the 55 cases which were not cured, 29 or 6 per cent. occurred in the first 462 cases treated, and 26 or less than 2 per cent. in the balance of 1314 cases.

Treatment was given on 33 voyages, an average of 54 patients a voyage, and, as the ship surgeon treated and re-examined these in addition to his routine duties, much work had to be omitted which would have been of scientific value.

The largest number treated on one voyage was 149, four of whom were not cured on arrival in San Francisco.

The number of daily treatments required to effect a cure may be judged from the following figures. Sometimes several treatments were given before a re-examination was made.

Mongolia. *Voyage 45.* *Dr. Terrill.*

61 cases.

51 or 83 per cent. cured in five treatments.
7 received 9 treatments.
3 or 5 per cent. received 14 treatments.

The maximum dose was gr. 80, excepting in the last three, in which it was gr. 100.

Korea. *Voyage 57.* *Dr. Sprague.*

82 cases.

11 or 13 per cent. cured in two treatments.
35 or 42 per cent. cured in four treatments.
18 or 22 per cent. cured in seven treatments.
6 or about 7 per cent. required 17 treatments.
One receiving 18 days' treatment was uncured.
80 grains of thymol was the maximum dose, excepting in intractable cases where it went as high as 120 grains.

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Siberia. *Voyage 54.* *Dr. Terrill.*

45 cases.

34 or 75 per cent. cured in five treatments.

1 or over 2 per cent. cured in 15 treatments.

Korea. *Voyage 56.* *Dr. Sprague.*

102 cases.

50 or about 50 per cent. cured in four treatments.

3 or about 3 per cent. uncured after 18 treatments.

80 grains of thymol was the maximum dose except in a few cases where 120 grains were used.

These results correspond very closely with results in the past as to the number of treatments required to effect a cure and as to the intractability of certain cases.

The limited period during which treatment could be carried out on board ship (an average of 27 days) made it imperativ to give large and frequently repeated doses.

In regard to the length of time required for a cure, the statement of Ashford in the 1911 Report of the Hookworm Commission in Porto Rico is interesting. He shows that the moderately infected cases averaged two months to cure, and that 21 per cent. of those severely infected required from 60 to 100 days. Treatment was given once a week and the average dose was 60 grs. of thymol.

EFFECTS OF LARGE DOSES OF THYMOL.

In several instances the ship surgeon, either on account of lack of time to make the necessary stool examinations, or possibly because of lack of confidence in his ability to pass final judgment upon the specimens, kept the treatment up in all cases until San Francisco was reacht. As an example, the Siberia sailed from Hong Kong on May 16th with 85 patients. They were all treated as follows:

May 17 and 18.....	Thymol gr. 80 daily.
May 19.....	Rest.
May 20, 21, 22.....	Thymol gr. 80 daily.
May 23, 24.....	Rest.
May 25, 26.....	Thymol gr. 80 daily.
May 27.....	Rest.

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May 28, 29, 30.....	Thymol gr. 80 daily.
May 31 and June 1.....	Rest.
June 2.....	Thymol gr. 80.
June 3.....	Rest.
June 4, 5.....	Thymol gr. 80 daily.
June 6, 7.....	Rest.
June 8, 9, 10, 11, 12.....	Thymol gr. 80 to grs. 120 daily.

There were no bad effects in any of these 85 patients who had received not less than 1520 grains, and a few 1720 grains, of thymol in a period of 26 days.

Much has been written on the bad effects of thymol and the dangers resulting from its use. Nearly every author who mentions thymol uses as much space to explain what a dangerous drug he is advocating as he does to explain the method of its administration.

'For some years past I have used large doses of thymol, often repeated for several days in succession, and I have yet to see any serious results from its use.

Practically but very little of the drug is absorbed, and it may often be noted that disagreeable symptoms, such as dizziness, nausea, and burning in the pit of the stomach, occur as frequently with small as with large doses.

In my experience there is practically no effect on the urine in the great majority of cases, and in the others it is but transitory.

The greatest effect is on the intestinal tract, and even here it is as a rule but slight and transitory. In hundreds of cases examined the stools appeared normal a few days after treatment had been discontinued. Occult blood, which is almost invariably present in even the lightest hookworm cases, usually disappears a few days after a cure is effected. Examinations for occult blood in over 100 cases treated by the Steamship Company showed all negativ a few days after heavy treatment had been stopt.

Loss of weight from the repeated purging is the only ill effect that the majority of patients show after a strenuous course of treatment.

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Of the 1776 cases treated by the Steamship Company, but one died of any cause whatsoever. A man, age 48, apparently in good health, was infected with hookworm and ascaris lumbricoides.

Aug. 18 in the evening received Santonin gr. 2, and castor oil oz. $1^1/_2$.
Aug. 19. Salts 6 A.M. At 8, 9, 10 and 11, Thymol gr. 20, 80 gr. in all.
Aug. 20. At night. Oil and santonin again.
Aug. 21. Thymol gr. 80. Salts before and after.
Aug. 22. Thymol gr. 80. Salts before and after.
Aug. 23. Oil and santonin at night.

He slept but little that night. On the morning of the 24th the patient was very restless and talkativ; made an attack upon one of the sailors; soon became somnolent. Pulse 110. Temperature 96.6. Catheterization showed the bladder empty. The patient died the following morning of uremia.

This patient received three treatments of thymol on the 19th, 21st and 22nd, respectively, slept poorly on the night of the 23rd, developt symptoms of uremia on the 24th and died on the morning of the 25th. Friends stated that he had suffered from kidney disease four years previously. Unfortunately, no urinary examination of this case was made before treatment. If this patient's condition was superinduced by the thymol, which I question, it occurred within 36 to 48 hours after only a moderate dose.

To quote Ashford again: "We have not shared the opinion of many as to the danger of administering thymol under a certain amount of precaution. The experience of two of us in some hundreds of cases in Ponce demonstrated that its danger was greatly exaggerated and generally resulted from its solution in alcohol or oil. We came to know that thymol was an exceedingly inoffensiv drug, as a result of our further acquaintance with it, etc. Our practical observation is that it is not absorbed to any great extent."

In the Steamship Company's series there were several cases of collapse, but none were serious and all resumed treatment later, that is, on subsequent days.

Vomiting frequently occurred, as often from the salts as from the thymol. In one or two cases the drug was discontinued on this account and chloroform and eucalyptus used.

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In one case an intestinal hemorrhage was reported, which was not serious and a few days later treatment was resumed without ill effects.

Under ordinary circumstances I do not believe that the very large and frequently repeated doses mentioned in this paper are necessary. Whenever the drug is administered in this way the stools should be examined at least every other day and preferably daily, in order to discontinue the treatment as soon as the patient is cured.

My usual plan of treatment where patients can be kept under observation, is to give two days' treatment with a day of rest following.

In an adult in good condition the first dose is not over 80 grains and is increast within a day or two to 120 grains.

Stool examinations are made daily and as soon as this proves negativ the treatment is stopt.

The average length of time required for a cure is about seven days.

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THE POWER OF QUARANTINE IN ITS RELATIONSHIP TO COMMERCE.

By M. W. Glover, M.D., Surgeon, U. S. Public Health Service, Washington, D. C.

The power of maritime quarantine, in so far as it is founded on law in this country, is exprest in various acts of Congress, especially that of 1893. But the power of quarantine is really derived from the necessity of exchanging our commodities for those of other countries without imperiling the public health.

It has been said that nothing is so cheap as human life. My observation, however, is that this always refers to the other fellow's life, not to one's own. Everyone shrinks from exposure to pestilence. It is this fear that gives to quarantine its power, exprest in the legal statutes. The power written therein is, within limits, absolute. In administration, however, it must be wisely used, the object ever being kept in mind, for abuse of power leads only to its loss. A stream never rises higher than its source, so in a democracy such as ours the power that flows from the people can never be greater than those who grant it. The United States Public Health Service endeavors to administer its maritime quarantine to the end that the public health may be protected with the least possible disturbance to commerce. In the furtherance of this aim we incorporate into our regulations and practices the advances of medical science. To those enthusiasts marching in the van who think we are slow and inclined to cling to old idols, I would say that, as a branch of the Federal Service, we reflect the sentiment of some 90,000,000 and that only after a practice has been thoroly proven may we safely adopt it.

The advances made in maritime quarantine in the last generation have been most rapid and to-day only the name remains to remind us of what the practices were in the early days of our country's commercial life.

The term quarantine, we are told, comes from an Italian word "quaranta," meaning forty. When instituted by the

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Venetians, and until modern times, the word implied a term of isolation for vessel, cargo and persons of forty days. It was supposed that by isolating the vessel and its contents for forty days they would free themselves from pestilential infection. It is probable, as suggested by Caldwell, that the period of forty days was fixt upon thru a superstitious regard for the 40-day fast of our Saviour, which the Church has recognized by the institution of Lent, a period of abstinence for the purification of the Soul. Or the period of the wandering of the Israelites in the wilderness before they were deemed worthy to enter the promised land may have had its influence on the superstitious institutors of quarantine in fixing forty days for the period of sanitary purification.

The early days of quarantine were the early days of commerce. It was learned thru bitter experience by communities that pestilences were carried to them thru intercourse with neighboring sources. Knowing nothing of the causes or modes of spread of diseases, what more natural than the attempt to stop the contagion by interrupting trade? The primitiv measures of quarantine we read of in medieval history we find repeated in the shotgun quarantines of our own country in modern times.

The first record we have of a well-defined code of quarantine regulations dates back to 1448 when Venice enacted a digest known as the Laws of Quarantine. This code required all vessels from suspected places to undergo a period of probation before they were allowed to enter the port and discharge their cargoes. Individuals were obliged to remain in isolation for forty days in the lazaretto or pest-house.

At this time Venice monopolized the trade of the Levant and her vessels visited every coast of Europe so that it is not surprising that, having suffered repeatedly from pestilence, she should have originated maritime quarantine. Bills of health are said to have been introduced in 1527 during a fatal plague in Italy, which lasted five years. Following the example of Venice, quarantines and lazarettoes as a means of protection were establisht by other powers along the shores of the Adriatic

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and gradually extended to other commercial nations, until it became a recognized procedure the world over.

As the means, extent and rapidity of communication between countries increast, commerce became more and more impatient at this arbitrary delay. It was pointed out that epidemics occurred despite the forty days spent in solitude and many argued that these pestilences arose from other sources than vessels arriving from infected countries. Thus quarantine fell into disrepute and in one country, England, it was abolisht. England is still without quarantine, it is often said, but, as a matter of fact, England has a quarantine, as we now understand the word, to which reference will be made later.

Modern quarantine retains little of the quarantine of older times other than the name. Founded on a more thoro knowledge of the epidemiology of diseases, its practices are dictated by common sense and reasonable application of the latest discoveries of medical science. Born of ignorant fear and superstition, quarantine struggled thru the centuries striking blindly at an intangible foe, until the period of renaissance of medical science dawned. When the researches of Pasteur, Lister, Koch, and other master minds establisht the germ theory of communicable diseases, quarantine ceased to be an arbitrary dictum founded on vague and now seemingly fanciful theories. The greatest advance in quarantine evolution was the application of disinfectants to vessels and freight. At one step this freed commerce from the arbitrary delay of weeks, and substituted for measures of absolute exclusion those of rational admission.

While we may complacently review the recent progress of quarantine it does not follow that we are at all satisfied with its present status. The evolution of this fase of public health work is still going on. More and more are we inclined to doubt the value of gaseous disinfection and more are we depending on fumigation for vermin, the known carriers of diseases. The advisability of holding in detention a number of people for the incubation period of a disease has also been questioned. The only reason this feature of quarantine is retained is because our local health administrations thruout the country cannot be

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wholly depended upon to keep under medical surveillance the passengers disembarkt from an infected vessel.

Quarantine, as now understood by sanitarians, may be defined as the measures necessary to prevent the introduction or spread of communicable disease. The measures include those of exclusion, detention, observation, segregation or isolation of persons, the disinfection of vessels and trains and the exclusion or disinfection of freight and personal effects.

Different countries have different quarantine procedures. The reason for this is that measures of quarantine are shaped in some degree by commercial and political expediency and to some extent by the geografic position of the country. Also, it must be remembered that a country quarantines only against diseases from which it is free or relatively free. Thus, in India where bubonic plague is endemic, no particular measures are taken to prevent the incoming of this disease. Manila has strict measures intended to guard against the introduction of plague, cholera and smallpox, while Eastern Asia apparently exercises no supervision over shipping with regard to these diseases.

That the geografic position may greatly modify quarantine measures is exemplified by England. Of the three quarantinable diseases recognized in Europe two, plague and cholera, have their endemic homes in Asia while the third, yellow fever, is indigenous in the West Indies and adjacent shores of the Caribbean Sea. From the latter England is protected by the fact that the stegomyia mosquito, the carrier of yellow fever, is unknown within her borders. From the two Asiatic pestilences she is guarded by the strict quarantine stations situated on the Suez Canal, and also by the length of time it takes a vessel to complete a voyage from the Orient.

Moreover, the internal organization of England's public health administration is such that she feels able to cope with any imported cases of these two diseases. She does maintain, thru port medical officers, an inspection somewhat similar to that of our own country. Suspected vessels are boarded and inspected for cases of quarantinable disease, and if any are found they are removed to isolation hospitals. The remaining passengers are

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allowed ashore, but by reason of the well organized local health system they are kept track of until a period of ten days has elapsed or until they have left the country.

In this way it will be seen that England does have a quarantine system in the sense that the word is now used, *viz.*, measures looking to the prevention of the introduction or spread of communicable disease.

In our own country the history of maritime quarantine is that of commerce and yellow fever. It was an epidemic of yellow fever in 1669 in Philadelphia that gave rise to the first recorded act in America, entitled "An Act to prevent sickly vessels coming into this Government."

From that time various quarantine acts were past by the different colonies and states, and controversies raged as to the value of quarantines as protectiv measures, and ever yellow fever was shown by one side to be indigenous and by the other to be imported. Various inconsistencies, abuses and impositions crept into the administrations of local quarantines, and it was not until Congress enacted the law of 1893, asserting the right of the Federal Government to control the quarantines of this country, that order began to appear out of the chaos of bitter controversies.

Efforts have been made to standardize quarantine measures by international conferences. The Paris convention of 1903, ratified in 1907, and revised in 1911, was signed by twenty-three countries, including the United States. The diseases to which this convention applies are plague, cholera, and yellow fever. To these three diseases the United States, in its quarantine procedure, adds three more, *viz.*, smallpox, typhus fever and leprosy.

Before discussing the organization of the United States quarantine, permit me to quote Dr. W. Perrin Norris, the director of quarantine of Australia, who in 1912, in a report on various quarantine systems, says:

"The quarantine organization for the prevention of the introduction into the United States and its dependencies of disease from oversea and its spread from state to state must, in my opinion, be admitted to be the best conceived and most com-

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plete in the world. It exemplifies the most logical application of the principles of quarantines."

The quarantine system of the Federal Public Health Service comprises a sanitary supervision of vessels at foreign infected ports thru medical officers attacht to the United States consulates, an inspection and examination at all ports of entry, with well-equipt quarantine stations on all sea-boards, the issuance of port sanitary statements to outgoing vessels, and the execution of regulations regarding interstate commerce and travel.

It is difficult to pick out in a well-organized system any one fase as the most important, but I would be inclined to give great credit to the work of our officers stationed in foreign ports. While they have only an advisory authority they are in a position to save commerce a great deal of embarrassment. Being familiar with the sanitary condition of their ports and contiguous districts, they are able to recommend measures that enable vessels to avoid bringing in quarantinable diseases. They inspect and certify to the condition of freight, and, being familiar with the localities whence the freight originates, they are able to discriminate in a manner impossible to the quarantine officer at the port of entry. They inspect the vessel, crew and passengers prior to sailing and, when necessary, observe under detention and isolation intending passengers for ports in this country. They supervise the fumigation of vessels to kill vermin and certify to the same, when satisfactorily done. They certify to the bills of health without which a vessel cannot legally enter a port in this country. These documents are most valuable. They give a sanitary record of the vessel and of the port where issued, reporting the number of cases and deaths of epidemic diseases occurring in the preceding two weeks.

Having past thru this first process of sifting out infection, the vessel departs on its voyage to the United States. The Service has issued regulations regarding sanitary measures to be observed during the voyage, the compliance with which will prepare the vessel for quick discharge thru the second process of sifting, the quarantine inspection at the port of entry.

This quarantine inspection is made between the hours of sun-

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rise and sunset. Immediately on anchoring, the vessel is boarded by the inspecting medical officer, who proceeds to assure himself of the condition of the vessel by a personal inspection of the papers, individuals and vessel.

Guided by the conditions aboard, the quarantine officer either grants her free pratique, provisional pratique, or places her in quarantine. In the first case, she proceeds to the wharf as a safe risk. In the second case, she also goes to the wharf but during her stay in the harbor certain precautions are to be observed to prevent vermin being landed. In the third instance the vessel proceeds to the quarantine station, discharges her crew and passengers, is disinfected and a clean crew put aboard, and the ship is then turned over to the owners. The crew and passengers remain at the station until in the opinion of the quarantine officer they are free from danger of conveying the disease for which the vessel was quarantined.

Speed is the word of this age. With ever-increasing power vessels cut hours and days from the time between ports. Today, special trains wait at the dock the arrival of a transpacific vessel. Valuable cargo is swung from vessel to train and hurried on its way across the continent. In every department the details are timed to the minute. Can one wonder then that everyone resents the delay of quarantine? Consider for a moment the position of the quarantine officer; on the one side are all the powers of commerce and wealth urging him to hasten the discharge of the vessel; on the other, stand the grim spectres of disease and death warning him to go slow. Fortunate, indeed, is he who can coolly consider the conditions and, uninfluenced by either fear, render his best judgment.

The discoveries of modern medicine regarding the spread of diseases are welcomed by no one more heartily than by the conscientious quarantine officer. That yellow fever, typhus, and plague were generaly spread by vermin and not by contact or fomites was a welcome dictum to the officer of the port. It gave him a definit object to attack and simplified his duties considerably. The old shotgun method of treating germ infection was replaced by definit measures directed to a definit end. He no longer seeks

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to destroy all germ life, frequently to the damage of vessel and freight, but is content to kill all vermin, feeling confident that he is removing thereby the source of a possible epidemic of plague, yellow fever, typhus, and who knows what other diseases. The commercial man, too, is interested and now coöperating. When one shows him, step by step, the connection between the germ, parasite, and man he readily grasps the idea, and, as no one likes vermin anyway, he is willing to coöperate in measures to clean up his vessel.

Interstate quarantine is establisht only, to quote the Act of March 27, 1890, "whenever it shall be made to appear to the satisfaction of the President that cholera, yellow fever, smallpox or plague exists in any state or territory or in the District of Columbia, and that there is danger of the spread of such disease to other states, territories or the District of Columbia." The Act of 1893 allows the Federal Government to administer the regulations for the suppression of epidemics within the states themselves under certain conditions. That these procedures are wise and worthy has been shown repeatedly in recent years. And it is hoped that the last vestige of medieval quarantine—the shotgun quarantine—will no more be seen in our country. I was forcibly reminded of the influence that modern quarantine has on commerce by seeing recently on a wharf in San Francisco a train of cars, each car of which bore a card certifying to the fact that the car and its contents were free from contagion of bubonic plague and bearing the signature of the medical officer in charge of the plague-suppressiv measures in New Orleans.

Thus, trade between a city or state afflicted with a disease and the rest of the country may be made safe thru the application of modern ideas of quarantine. And such it is hoped the future may bring to pass in maritime quarantine. Outgoing quarantines are along the same lines. Passengers, freight and vessels are inspected, held under observation, if necessary, fumigated or disinfected as may be required and certified to, so that quarantine endeavors to guarantee to other ports that the vessel and its contents are free from danger of carrying the disease.

In this way it may be seen that quarantine is no longer a hin-

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drance to commerce but on the contrary a decided aid. In no other way would it have been possible for New Orleans to have continued her trade uninterrupted than thru modern quarantine methods.

In just such measure as our quarantine service is supported and recognized and its efficiency demanded at home will its influence and authority be recognized abroad. Cholera in the Mediterranean in 1910 and 1911 carried with it no interruption of trade at Atlantic ports, due to the coöperation of quarantine officers in Italy and this country.

Sooner or later to every quarantine officer there comes the illuminating idea that there really ought to be no excuse for his position. If every community had a proper health organization and administration, each vessel with its passengers and freight would be clean and free from all danger of spreading disinfection. Commerce would no longer be smircht with the taint of disease, and trade between communities would be freed from the restrictions of quarantine. We know enuf to-day of the causes, modes of spread and prophylaxis of the quarantine diseases to wipe them out. Universal vaccination would remove smallpox from the category of pestilences. Proper disposal of fecal matter and safe water supplies would render the spread of cholera impossible. To wipe out yellow fever we have but to destroy the mosquito. With the destruction of rodents or, failing that, the rat-proofing of buildings, sanitary disposition of garbage, etc., bubonic plague ceases to be a wide-spread terror. Personal cleanliness and sanitary housing will give to vanishing typhus fever its final blow. The day may come, however, when commerce will be freed from all restraints of quarantine, but only when commerce has freed herself from disease.

When we once understand that quarantine is only an attempt to prevent the evil results of faulty sanitation entering our country thru commerce we will have a clearer understanding of how an end is to be put to quarantine. The first step is to do some sanitary sweeping before our own door. Every case of typhoid fever is a reproach to the place it arose in, and the amount of typhoid might be taken as an index of how serious an epidemic

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of cholera would be. The amount of malaria in a community may be taken as an indication that were conditions proper, yellow fever would prevail to an equal or greater degree. It is not within the province of this paper to go into the ways and means of how these sanitary reforms are to be brought about. I merely wish to present this idea to this Society, believing that it belongs peculiarly in its province: The one reason for quarantine is that disease attaches itself to commerce and has done so since trade began; the proper sanitation of communities would remove disease from commerce and quarantine would die out; the place to begin is at home.

Sentiment has probably no place in commerce and yet no activity of man can escape it. The sanitary work done by the United States in Cuba, in the Canal Zone, and in the Philippines, has had a far-reaching effect on the pride of other countries, and the spirit of emulation is spreading all thru the tropical world, and I believe we may confidently look forward to the time when the Panama Canal will not only bind countries closer commercially, but the sanitary lessons there exemplified will strengthen the work of each health officer and sanitarian the world over.

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ARE THERE HARMFUL AND HARMLESS HOOKWORM INFECTIONS?

By Victor G. Heiser, M.D., formerly Director of Health of the Philippine Islands, Manila; Director for the East, International Health Commission of the Rockefeller Foundation, New York.

Of the disease producing capabilities and of lessening the working efficiency among the people of the Southern States, Porto Rico, and many other places, there is now sufficient evidence to leave little room for doubt that hookworm infection is an important factor. The experiences in Java, the Federated Malay States, the Straits Settlements, and the Philippines, apparently show that hookworm of the harmful type is found from time to time, but on the other hand they also show that hookworms of both the old and the new world variety are often present in the human intestines without giving rise to any special symptoms.

In the Philippines, for instance, it was found in Bilibid prison in 1907 that the death rate among approximately 3000 prisoners was about 80 per thousand per annum. The conditions in the prison had been made hygienic. The ration was carefully corrected by a competent physiologist; the water supply, drainage, disposal of human wastes, ventilation, were made to conform to modern principles of hygiene and sanitation. All of this resulted in a considerable lowering of the mortality rate but it could not be reduced below 80, which was excessiv. The prisoners were then examined for hookworm and other intestinal parasites, approximately 60 per cent. were found to harbor hookworm, and over 90 per cent. had some form of intestinal parasite. Treatment to eliminate all varieties of parasites was at once begun. The prisoners were quartered in brigades or groups of about 300. As soon as the treament of one brigade was completed there was an immediate reduction in the morbidity and the mortality dropt to 10 to 12 per thousand per annum, while the morbidity and the mortality in the untreated brigades remained as high as before. One brigade after another was treated and when the last

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was completed the mortality rate for the entire prison was approximately 12 per thousand per annum. It was naturally thought that if such truly marvelous results could be obtained among prisoners, equally good results might be had by treating the general population. In order to test this matter thoroly a commission was formed composed of members of the Philippine Medical School, the Bureau of Science, the United States Navy, and the Bureau of Health.[1] The commission selected for study the people of the inland town of Tay Tay, located about 20 miles from Manila and not affected by tides or salt marshes. Several thousand persons were examined and an average hookworm infection of about 12 per cent. was found and about 90 per cent. of those examined had some form of intestinal parasite. All infected persons were treated. There was, however, no apparent reduction in the morbidity and no reduction in the mortality. Observation extended over a period of several years. Studies of the causes of death did not show the presence of any unusual disease, so there was no known factor to offset any possible gain which might have been brought about by the elimination of the intestinal parasites. It is perhaps well to state treatment was administered for any other disease that was found. The only striking difference between the infections at Bilibid and at Tay Tay was the reduction in the percentage of hookworm infection: at Bilibid it was approximately 60 per cent., whereas at Tay Tay it was 12 per cent. The percentage of infection with other parasites was about the same.

In order to test this matter still further, the Bureau of Health had about 10,000 examinations made among the people of the sea coast town of Las Piñas and vicinity. The results were practically the same as at Tay Tay. The town of Tuguegarao, located on a large navigable river and about a hundred miles inland, was next selected. The results were again practically the same. Work was continued in other towns until a total of about 25,000 persons were examined. The results still remained

[1] Full reports of the work of this commission may be found among publications of the Bureau of Science.

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unchanged. In the same valley in which Tuguegarao is located, laborers numbering about 500, at work on a plantation, were reported to be unusually lazy and that much sickness existed among them. They were examined and approximately 65 per cent. were found infected with hookworm and about 80 per cent. had other intestinal parasites. They were treated and results comparable with those of Bilibid were obtained.

Reports of hookworm infection without symptoms then began to be received from Queensland, the Federated Malay States, Straits Settlements, and this year Java reports similar cases. But on the other hand Ceylon and Egypt reported hookworm infection with symptoms similar to those found in the Southern States and Porto Rico.

Hookworm work in the Philippines except in Bilibid prison, among arriving aliens, and patients in hospitals usually from other causes, has for the present been discontinued as a public health measure, because the money used in combating hookworm infection will produce greater results in other lines of endeavor.

From the foregoing it is obvious further inquiry into the effects of hookworm infection is highly desirable so that the whole subject may, if possible, be placed upon a more scientific basis. It is most important for the health official charged with the responsibility for the public health and the wise expenditure of public funds, to have reliable information, whether the control of hookworm is to be undertaken or whether some other activity should be given preference.

With the hope of throwing some light upon this important question the International Health Commission has appointed a board composed of Drs. Darling and Barber of the United States and Dr. Hacker of the British Colonial Medical Service to make a thoro study of the question. The Board has commenced its labors in the Federated Malay States and later will probably continue its investigations in Java and the Philippines.

On account of the very general public interest in this matter, and in order to have as many data available as possible, the International Health Commission, 61 Broadway, New York City,

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will welcome any information medical men from any part of the world may care to send.

DISCUSSION.

Dr. Woods Hutchinson, New York:

The subject is one of the most important and most vital we have to face. If any proof were needed, the statement that 60 per cent. of the Chinese coolies examined were found infected with hookworm ought to be quite sufficient. Examination in the Marine Hospital and by the Public Health Service at the point of embarkation and upon entrance here is going to protect us from an immense amount of disease.

I am glad there is a prospect of what was suggested in Dr. Blue's paper. We ought to have a school of tropical medicine and there is no finer place for it than in California.

We are going back to the tropics. We began there in the beginning, and it was a mighty good place to migrate from. Those of us who have remained in the tropics have remained savage, stupid, half civilized, because we were bitten and bost by insects, bugs and worms and infected with all sorts of disease. Now we are going back to reoccupy and reconquer for the white race those great fertile stretches of country in which we originally grew up. Hitherto our success has depended largely upon the degree to which we have separated ourselves from that district.

We have a more or less natural self-acting protection against many of these tropical diseases. Hookworm we find to be one of the ordinary appendages of humanity in the thirty degrees of latitude north and south of the Equator. That belt entirely around the earth is infested with hookworm and humans just about in equal proportions, forming about one-third of the human race. The study of the American hookworm has revealed it to be one of the most curiously fascinating fruits of justice of the crimes of man. Strange as it may be, as soon as it was thoroly described, it was found to be identical with the Necator African brought here with the African slaves, and it has remained to be a scourge to the man who captured them. The best protection against hookworm is good shoe leather. It is a barefoot disease, and I have a strong suspicion that some of our feeling as to the disrespectability of going barefoot is a remnant of some ancestral feeling of this sort.

Against plague also we have a protection and against typhus fever, and that is a clean undershirt. The undershirt should be changed several times a month, with profuse bathing. A clean undershirt is the best health-protector that we have invented and will protect us from more evils than any known weapon.

So, while I think we ought to take every precaution to fight off and keep out these infections, at the same time, we are not without resources of protection against them if they should be imported into our midst.

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Dr. Philip King Brown, San Francisco:

I would like to ask Dr. Gunn whether the examination of stools of people coming from the Orient is confined to any special class. Do the first cabin passengers have to submit to such examination? If not, why not? Among the discharged soldiers from the Philippines, a very large number are infected, or were in the earlier days. It used to be no uncommon thing to have 90 per cent. of the men admitted to the County Hospital who had served in the Philippines still infected with hookworm.

Dr. J. W. Kerr, Washington:

We are having constantly imprest upon us the importance of transportation in relation to the health of the people; especially has the recent enormous immigration presented problems which the Public Health Service has endeavored to meet. Last year, out of approximately 1,500,000 immigrants reaching the United States, over 38,000 were certified for deportation. This number could have been greatly increast by more extensiv examinations. These are being discust widely to-day, and it has even been a question in the minds of the officers engaged in making these examinations whether eventually the same standards should not be prescribed for those who are candidates for citizenship as for those who are selected to enter the army and navy in the defense of the country.

It must be borne in mind, however, that many of the diseases among immigrants which have recently attracted our attention are not new in our country. Within a period of ten years, some of the most important diseases which confront us to-day have been discovered as endemic here, altho they had been hitherto regarded as exotic. I may mention filariasis and Malta fever, which have been discovered in the recent past in the Pecos Valley and other sections of the South. Trachoma has been discovered among the oldest American population, where it is widely prevalent. 22.7 per cent. of 39,231 Indians examined by officers of the United States Public Health Service in 1912 were shown to be suffering from trachoma. Lastly, I may mention the discovery of pellagra in 1907, a disease which since that time has attracted general attention and is, perhaps, the most serious disease, from an economic and public health standpoint, in the South.

I think bodies of this kind can help to crystallize the public's views as to what steps should be taken toward the absolute prevention of these diseases. They can also mold public opinion as to how rigid immigration examinations shall be, always bearing in mind, first, the protection of the public health and, second, the encouragement of international relations.

Dr. Philip King Brown:

I would like to ask Dr. Blue if it is true, as stated in "*Osler's Practice*" that 10 per cent. of the deaths from pulmonary disease are due to the dis-

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toma Westermanii and whether it has ever been discovered in natives of this country, or among the Japanese dying in this country.

Dr. Rupert Blue:

I do not know of a single case of paragonamiasis having originated in this country. It is possible, however, that the infection might have been brought over by Chinese and Japanese immigrants.

Dr. George E. Ebright, San Francisco:

The California health authorities are very much awake to the importance of the subject of Dr. Gunn's paper. A complete survey of the situation in the state has not yet been made. The recent legislature, however, has provided means at the hands of the State Board of Health and it appears that the hookworm problem in California will be successfully workt out. The chief foci of infection are among certain of the mines in Amador County where the health authorities have met with every desirable cooperation upon the part of the mine operators.

Dr. Herbert Gunn, closing:

In regard to the question Dr. Brown askt, of course, the class of people he mentioned, the soldiers, do not come under the jurisdiction of the immigration authorities. It is an unfortunate fact, and a very weak link in the chain of protection against Oriental diseases, that only certain classes, those who are aliens, are subject to examination. Even among the Chinese and Japanese, many cases carrying oriental disease may step out of the immigration hospital and come to San Francisco. If a man is a citizen or a domiciled alien he is allowed to land regardless of disease. Those are matters that should be taken up by the State Board of Health, especially in California, and these people should be turned over to them for their attention.

Some of the diseases that Surgeon Blue mentioned are very interesting and will be found more prevalent than in the past. In the last two years I have made something like seven or eight hundred examinations of Chinese for certain diseases, and have found that the *clonorchis sinensis* that Dr. Blue mentioned was carried by about 20 per cent. of the Chinese coming into the country. I also find that it is one of the greatest causes of disability among the Chinese, next to hookworm.

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REFRIGERATION, TRANSPORTATION AND CONSERVATION OF POULTRY AND FISH PRODUCTS.

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INTRODUCTION.

In these days when so much is heard of our failing meat supply, it behooves us to take account of stock. We should consider the more common and popular substitutes for meat, the outlook for the increast production of these substitutes, and also improvements in methods of handling, transportation, and conservation. The interest in pure food matters and the demand for sanitary products require that this fase of our problem must never be overlookt. It is at once obvious that the main foodstuffs similar to meat are poultry, eggs, fish and shellfish, both of which latter are often groupt together under the name sea-food, forgetting the large production of fish from the lakes and rivers of our Central West. It is surprising to learn that the United States annually produces at wholesale prices about $500,000,000 worth of eggs, $300,000,000 worth of drest poultry of various sorts, and over $100,000,000 worth of fish and shellfish. Among the fisheries, canned salmon is a leading item, being valued at over $25,000,000 in the 1914 season. With the exception of canned, salted and cured products, every one of the foodstuffs we are considering is perishable to a most serious extent, a fact which makes the annual loss from spoilage, due to poor handling and lack of refrigeration, amount to 10 per cent. of their value annually. Egg shells are fragile, and this also adds greatly to our loss on eggs, besides that suffered thru the deteriorating effects of heat.

Eggs and poultry are produced in every state, but it is usually in certain of the central and southwestern states that the supply exceeds the demand in that particular locality. In other words, the great cities on the eastern coast, and to a less extent those on the western coast, must draw their chickens and eggs from far distant places, necessitating long train hauls and expensiv refrigeration in transit. The points of production and packing establishments for poultry and eggs are widely scattered, and in

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this way offer a contrast to the meat industry, which draws its supplies from a large area but has its packing plants in a few places. In our fisheries, we find the main producing points scattered along the length of our sea coast, lakes and rivers, with the wholesalers selling the fish thru centers like Boston, New York, Norfolk, Pensacola and Seattle. Every year many million pounds of salmon and halibut are shipt three thousand miles from the Pacific coast to the more eastern cities. Large scale oyster operations are mostly limited to New England, Long Island, and Chesapeake districts, with smaller centers on the Gulf and Northern Pacific coasts. As in the poultry industry, the fish and oyster business has been so widely scattered that there has never been the same opportunity for developing standardized operations, use of by-products, and control of the relation of supply and demand, that have made the meat packers so successful. Also, the character and methods of the poultry and fish industries vary greatly with local conditions. Certain markets demand different grades of chickens, just as the nature of the handling of fish has to depend upon their kind and size, as well as upon the trade customs of the group of fishermen and consumers involved. As we shall see later, these local differences are greater in the fish business than in the case of the poultry industry, and very much more so than in the centralized and standardized meat industry.

HANDLING AND REFRIGERATION OF DREST POULTRY.

Formerly chickens were killed to-day and eaten to-morrow, because decay could not be checkt for any length of time. Then, as the farms were pusht away from the edges of the growing cities, crusht ice was used to preserve the drest birds until they could reach the consumer, a matter of a week, perhaps. The people increast in the cities faster, however, than the chickens multiplied on the near-by farms. The hauls soon became too long for farm wagons, and then the railway was called into service. Each year for 20 years or more the railroads have been carrying to eastern and western cities drest poultry from a wider and wider radius. Texas turkeys and Oklahoma chickens are sent to New York and San Francisco.

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Good handling of drest poultry necessitates facilities which cannot be maintained by the individual farmer. Drest poultry is now a business by itself, and a great industry has grown up to attend to this work. Therefore, when the farmer's flock has reacht a marketable stage he sells it to the poultry packer, or to his agent. As received by the poultry packers, the fowls are generally hungry and thirsty and are always nervous and tired; hence they are not in condition to be killed. Many of them are thin, because comparatively few farmers feed their poultry enuf to fatten them. The poultry packers have establisht feeding stations where from 10,000 to 30,000 birds, housed in specially constructed feeding batteries, are given clean grain mixed with buttermilk for from 7 to 14 days. The 7-day feeding causes a great improvement in the flavor and tenderness of the flesh and increases the weight. After the feeding period is over the birds should be starved for 24 hours, having a plentiful supply of clean water only. This practice results in almost completely emptying the intestinal tract of foods in process of digestion and of waste products to be thrown off, and has been found to be far better than the practice of eviscerating when the bird is killed.

In the better establishments it is customary to kill the birds by cutting the jugular vein with a slender straight-edged knife, especially constructed for the purpose. Then that portion of the brain tissue which controls the muscles holding the feathers in place is destroyed by a thrust of the same knife, and the feathers are so loosened that they are easily pulled out. The cutting of the blood vessels in the proper way permits the blood to drain out of the carcass until it is practically blood free. This is essential, if the bird is to keep well, and is a part of the process of dressing that is too often faulty. In order to accomplish this bleeding the vessels must not only be cut properly, but the bird must be held head down while removing the feathers.

The up-to-date packer no longer uses ice to remove the animal heat. He has mechanical refrigeration and provides clean insulated rooms in which a temperature of about 32° F. is constantly maintained. The chickens are hung by the feet on racks made entirely of metal. The time required to chill the fowl is

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usually about 24 hours, and the packer must be sure that the viscera, as well as the skin and flesh, are free from heat before the birds leave the chill room. It is the failure to observe this requirement that is responsible for much of the bad-conditioned poultry in our markets. The range of temperature permitted, too, is small. Below 28° F. the flesh is frosted; above 35° F. decay proceeds too rapidly to permit of long hauls to distant markets. Having removed the natural heat from the drest fowls, the next step in their preparation is to grade and pack in suitable containers for shipment. This operation should be performed in a room having a temperature of 30° F. and in this room the packt boxes may remain for several days while awaiting shipment. Of course, the birds can be frozen hard after they are chilled, and so shipt, and this is a very excellent plan, especially if the haul is across a hot country.

The up-to-date processes of killing, picking, chilling and packing poultry used in the better establishments are gradually being adopted by other houses. Once it was the universal custom to plunge the recently killed birds into hot water to loosen their feathers. This is known as scalding. It is being discontinued because the hot water scalds and loosens the skin so that the pickers necessarily tear it in removing the feathers. These tears, and the partially cookt state of the skin, make it decompose easily, and offer an easy point for the attack of bacteria, thus starting spoilage of the whole bird. When the fowls are killed and bled by cutting the jugular vein and destroying the brain tissue at the same time, a much better appearing and keeping product is obtained, and the picking is made easy.

Formerly, drawn poultry was in demand, but at present the weight of opinion, scientific and practical, is against the evisceration of chickens held for shipping, or for freezing and holding. When the body walls of the birds are cut, and when the entrails are removed with the hand, it is easy to see that the body cavity becomes smeared with blood and intestinal contents. However carefully the bird may be washt and wiped, the bacteria on the surfaces can never be wholly removed. For this reason, both shipping and storage experiments have shown that undrawn

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birds are not nearly as prone to decomposition as those that have been eviscerated. As we have already seen, it is the best trade custom to stop feeding the chickens in the fattening rooms about one day before killing, in order that the undigested food material may have time to pass thru the birds and leave their intestinal canal practically empty. When such birds are killed, pickt and packt in the proper way, they have an attractiv appearance and keeping qualities that always command a high price.

Until mechanical refrigeration became more common in poultry killing houses, and until the trade came to realize the better quality of poultry which had not been cooled in water, or packt in ice, it was customary to chill the freshly killed birds by immersion in ice water, and to ship in barrels packed with ice. The soaking of the poultry in the water from the melted ice, the dirty heads and feet, and the gradual dissolving out of the soluble parts of the flesh, caused a loss in eating quality and induced decay. Research has shown that ice (wet) packt poultry more readily undergoes decomposition because of its water soakt condition and contamination with bacteria from filth on the feet and so on. It is evident that there are two losses in shipping poultry with ice in barrels: first, the birds soon become immerst in dirty water from the melting ice and absorb a certain amount of water; second, they also lose some of their water-soluble food constituents. The total loss is a resultant of the amount of water absorbed and paid for at the price of chicken, and of the quantity of nutrients dissolved by the water in the barrels. Experiments prove that this total loss amounts to over 10 per cent. of the weight of the original chickens, or a money value of about $400 on each carload of drest poultry. Fortunately, the present tendency in the poultry industry is toward the elimination of wet packt poultry.

FROZEN POULTRY.

Freezing poultry during the season of excess production, and holding it in that condition until the season of shortage arrives, has become a trade practice in the United States. Goods so kept are commonly called "cold-stored," tho it is a difficult matter

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to draw a sharp distinction between produce which is held for weeks in a chill room, yet is accepted on the market as "fresh," and that which is frozen for transportation or marketing purposes and held, possibly for several weeks, in a frozen state, and goes, therefore, as "storage."

It is very desirable that the poultry which is to be put in cold storage should be dry pickt and dry chilled. Poultry which has been cooled in water shows blistered areas and an unsightly drying out of the skin after comparatively short periods of storage, while the scalded fowls have not only unsightly skins but a deepening of the color over legs and thighs which is very undesirable. It has been observed by the more experienced members of the industry, and confirmed by scientific investigation also, that scalded poultry does not keep as well as that which is dry pickt; neither does the water-cooled product keep as well as that which has been air chilled. Larger packing houses at the present time aim to have not only a chill room, such as has been discust, but also a room maintaining a temperature below 0° F. (—18° C.). In this room the chilled birds in boxes are kept until hard frozen. They may be carried by the packer hard frozen at 10° to 15° F. (—12° to —9° C.) until sold, or they may be shipt, immediately after freezing, to a warehouse which is in proximity to their final market.

It is a comparatively simple matter to keep birds in good condition from one season of production to the next in a well-constructed cold storage warehouse, provided that they are received at the warehouse properly drest, chilled, and packt, and with such promptness that decomposition has not obtained even a slight foothold. Under such conditions the responsibility of the warehouse is the maintenance of cleanliness and a constant temperature which is not above 15° F. (—9° C.), and which preferably should be nearer 10° F. It has recently been estimated by a competent observer that $30,000,000 worth of poultry is frozen and stored annually in this country.

HANDLING AND REFRIGERATION OF EGGS.

The egg trade of the United States involves not only a vast number of people, but represents an enormous sum of money

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annually. It yields, also, a foodstuff of very high value, which is assuming greater importance to the nation because large meat animals have become scarcer and higher-priced. Many of the difficulties surrounding the production of meat animals do not apply to poultry. Chickens will thrive under widely varying conditions and can be fed a variety of food, much of which would otherwise be wasted on the farm.

The broadcast nature of poultry raising is another important feature. The census of 1910 states that poultry is raised on 87.8 per cent. of the farms of this country, but it does not take into consideration the many producers of poultry and eggs in the towns or city suburbs where the small chicken yard plays a significant part in the egg and poultry supply of the community.

The farmer usually delivers the eggs to the storekeeper or packer's agent by wagon. From these receivers they commonly go to a central shipping plant, which is generally known as a "packing house," and which handles goods in car lots. This plant may or may not be provided with the proper facilities for doing the work assigned it. To reach the packer, however, the eggs generally go by train and in comparatively small quantities, therefore, as "less than car lots," or what is known to the railroad men as "l. c. l's." For such small lots and for short hauls the goods are pickt up by a local freight train. The wait at the station, which is frequently only an open platform on which the cases remain until the arrival of the train, and the haul in the "pick up" freight car, the temperature of which is governed entirely by atmospheric conditions, result in rapid deterioration in summer and sometimes freezing in winter. Often in summer the car becomes an excellent incubator, holding well the sun's heat even in the cooler hours of night, and it is not unusual in the summer months for the packer to be greeted by the cheerful "cheep-cheep!" of newly hatched chicks as the cases are carried into his receiving room.

The progressiv packer, who generally handles poultry, eggs, and butter, is now equipt with an artificially refrigerated chill room which maintains a temperature of 40° F. or a little less in which he keeps his eggs until shipment. If he is wise he rushes

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the egg cases into that room, stacks them loosely, and chills thoroly before shipping to his market center. He also candles in a room which is chilled, removing rotten eggs and broken eggs and grading according to cleanliness, size, and, to a certain extent, freshness. After the packer has graded and repackt the eggs in boxes holding 30 dozen each, with clean "fillers"—as the little strawboard racks which hold the eggs are called—he ships them to the market center, generally in car lots, or holds them at about 35° F. The packer has a chance to control the temperature of the car, keeping it iced in summer or closing it to prevent freezing if the weather in transit happens to be cold.

Size, cleanliness, cracks and color may readily be determined by inspection; freshness, in the sense of a high quality, firm-bodied egg, rather than in the lapse of time since laying, is determined by a process known as "candling." The egg candle consists of a bright light, generally an electric incandescent bulb, protected on all sides by an opaque shield in which are one or two oval holes a little smaller than the egg. The eggs are prest firmly against these holes and, as the light shines thru, the yolk and white may be seen, as well as the air space at the large end of the egg and any foreign bodies that may be present. In the spring of the year when 50 per cent. of our eggs are produced and the conditions of production, climate, and markets are most favorable for marketing eggs of good quality but little candling is done in the producing section. In the large consuming centers some eggs are candled at all seasons, to insure, as far as possible, the distribution of good eggs only to the best trade. It has been said that climatic conditions have the greatest influence on the quality of the eggs coming to the markets. Too much rain means that the hens have muddy feet, hence the eggs may be soiled even when deposited in clean nests; but when laid hither and yon, in stolen or unkempt nests, as so many farmers permit their birds to lay, the proportion of dirty eggs is greatly increast. Heat, however, is the most prolific source of trouble. Hot weather not only puts the hen out of condition, but it hastens all the evils than an egg is heir to after it is laid. Its flavor is lost sooner; evaporation is hastened, hence the

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shrunken state comes more quickly; worst of all, the development of the embryo in the fertilized egg proceeds with a greater and greater steadiness and rapidity as the temperature rises, resulting in a large proportion of the "rots" and "spots" of commerce.

In order to preserv the desirable qualities which are found in the new-laid egg until it reaches the consumer the development of the chick must be reduced to a minimum. Germination of the fertile egg begins before it leaves the body of the hen and growth of the chick will continue if the temperature is greater than 68° F., tho, of course, the rate of development is slower if the temperature is below 103° F., the normal incubation temperature for eggs. Nine-tenths of the vast number of eggs that are candled out every summer as unmarketable are fertile eggs in which the germ has started to develop. A temperature of 70° F. will start the germ in a fertile egg to slowly developing. A fertile egg, subjected to a temperature of 100° F. for forty-eight hours, will be unmarketable, while an infertile egg may be subjected to the same temperature for a week and still be perfectly good for cooking purposes. The simple expedient of shutting up or disposing of the adult male birds as soon as the hatching season is over, if it should become the general custom, would result in the saving of a million dollars' worth of eggs every season. In the Middle West, a slogan "Swat the rooster" has become popular and is successful in limiting the number of fertile eggs and, consequently, preventing large losses from the spoilage of eggs thru incubation.

COLD STORAGE OF EGGS.

The preservation of eggs has for centuries been a problem, since eggs, probably more than any other food staple except fish, are dependent upon seasons and conditions for production. In the temperate zone the sequence of seasons results in the production of a large proportion of the whole year's lay during the spring months. In the winter months the production, as compared with consumption or demand, is extremely small. Hence the necessity of preserving eggs from April until Decem-

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ber in a wholesome condition, retaining as much as possible of their freshness of flavor.

Of all the various methods for the preservation of eggs, cold is, so far, the best. Its application to the keeping of eggs, however, must be along definit lines. As has been stated when discussing the application of refrigeration to the marketing of poultry, it is efficacious in maintaining high quality for a reasonable period of time if the eggs are put into the cold room in prime condition. Cold does not make them better, whether of low or of high grade, and when deterioration has already begun cold does not retard the process to the extent that it does when the eggs are fresh. The use of cold, therefore, as a preservativ of eggs depends very largely for its success upon the condition of the goods when they come to the cooling room or the storage warehouse. The range of temperature used in the handling of eggs, however, is very small by comparison with that commonly used in handling poultry and temperatures low enuf to freeze the eggs, even superficially, are disastrous.

Artificial refrigeration is more extensively used when eggs are to be kept for the season of shortage than for the preservation of high quality and the prevention of deterioration during routine marketing. Happily for the consumer, however, the industry is beginning to recognize the value and importance of keeping eggs cold thruout their entire journey from the hen to the table; happily, too, for the industry, since the application of practical chilling methods will in a large measure wipe out the losses which are now so prevalent.

According to trade practices, storage eggs are graded in the early part of the laying period by size and cleanliness, packt into a rather heavier filler than is used for current consumption, and stored in odorless wood boxes, 30 dozen to a box, at temperatures ranging from 29° to 32° F. (—2° to 0° C.). The questions of temperature and humidity and cleanliness are of great importance in the successful cold storage of eggs. The temperature must not permit freezing of even the most superficial kind, yet the colder the eggs can be kept without congelation the better. Fresh eggs which are thick bodied, as laid by well-fed

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hens, can be held advantageously at 29° F. (—2° C.); on the other hand, thin eggs, or those which have begun to deteriorate, may require 32° F. (0° C.) for safety. It is scarcely necessary to say that the latter will not keep as long as the former. A constant temperature within small limits in long storage is an absolute necessity. Humidity in egg keeping is a subject which is much in need of close scientific investigation. It would seem, from the experience of the industry, that the desired relativ humidity of the atmosphere is variable and depends to a certain extent, at least, upon the construction of the storage room, the quantity of eggs stored, and the environment in general. Temperature and humidity must always be kept adjusted so that moisture will not deposit on the surface of the eggs. This is known as "sweating" and causes rapid deterioration by encouraging the growth of bacteria and molds. Every effort is made to keep the egg-storage rooms free from odors, no other commodity being allowed in the same room. A plentiful coating of lime over wooden surfaces, freshly applied before the eggs are received, is the most common method of keeping walls and floors odorless.

The statement that a cold-stored egg is as good as an egg just from the hen is never true. An egg is best when newly laid. Every day causes a loss in eating quality. When environment is bad, one day may render an egg unfit for food; when environment is good, weeks will make so little change that only an expert taster can tell the difference. The length of time that eggs can be kept in cold storage depends very largely upon their condition when they enter it. As already stated, eggs laid early in the season during cool weather keep best. Carefully graded, packt, and transported, such eggs are good food at the end of nine months, when held at 29° to 31° F. in a properly managed storage plant.

The unfairness in handling cold-stored eggs comes from the retailer who usually does something like this: The very large, clean, best-order eggs are sorted out as "strictly fresh," the next most desirable as "fresh," and so on with prices ranging accordingly. In order to sell these for what they were not, a

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mistaken impression of all stored eggs is given by calling the worst eggs in the shop "cold storage." Every man who handles those eggs knows they are cold stored and pays a price in accordance with that fact, except the consumer. The consumer, partly because of ignorance concerning the season of egg production, partly because of prejudice against all cold-stored eggs for all purposes, has allowed the retailer to trade upon his ignorance and prejudice to the great betterment of the retailer's pocketbook. Fortunately, the consumer is beginning to realize more and more that when properly controlled and managed cold storage is a stabilizer of trade in perishable foodstuffs and that it alone makes available many necessities and delicacies of the table in seasons when nature does not provide them.

FREEZING AND DRYING EGGS.

There are three widely used methods of holding eggs for a later consumption: First, storage in the shell under artificial refrigeration at temperatures ranging from 29° to 31° F.; second, the contents are removed from the shell, the liquid placed in cans, frozen solidly and held in a frozen condition until used; third, the liquid dried and later dissolved in water at the time of using. The methods of handling and refrigerating eggs in the shell have already been outlined, and now a little may be said of the business of preparing frozen and dried eggs for the market. Of course, eggs in the shell cannot be hard frozen without breaking the shell and ruining them for sale. However, after breaking and removal from the shell, eggs may be hard frozen and transported or stored in this condition for many months. Frozen and desiccated eggs have provided an outlet in the producing section for small-sized, dirty and slightly stale eggs which can be held frozen or dried for many months until needed for baker's use. Such advances have done much to increase production and to effect economies in eggs as a food. Under present conditions, such small, dirty or crackt eggs are not worth shipping to distant markets during the season of production, but are highly desirable if held in an unaltered condition until winter time. Eggs which have become slightly stale frequently deteriorate during the haul to market to such an extent that they

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are unfit for human food. Eggs of the foregoing grades do not keep well if cold-stored in the shell. Hence they are released from the shell when fresh, placed in tin cans and immediately frozen.

When eggs are removed from the shell in the most sanitary manner in clean breaking rooms, under almost surgically aseptic conditions, they can be frozen to give a most valuable form of egg preparation for bakers and chefs, to use in cakes and so on. These broken eggs may be used for all purposes where it is not necessary for the egg to appear in its unchanged form of white and yolk. Girls in white working clothes and caps break the eggs one by one, discarding those which by appearance or odor give evidence of being unfit for food. The skill of these girls in breaking and judging eggs is astonishing. The broken eggs are placed in large cans containing about thirty pounds, and are frozen, after which they may be easily stored or shipped in these containers. In some cases, whites only are put in a can to be used for making icings or "angel cake," in others just yolks are placed, and in still others, the whole mixt eggs. There is nothing more perishable than the broken eggs when thawed, so they are shipt in refrigerator cars under heavy icing and salt, like meat.

Eggs in a dry form are more stable than in the shell or hard frozen; hence they can be used on ship-board, in tropical climates, in the far North, and wherever stability and decreast bulk and a lack of refrigeration are important considerations. After removing the egg from the shell with all the precautions pertaining to the preparation of eggs for freezing, the well-mixt liquid is evaporated by heat in various mechanical appliances until only about 10 per cent. of water remains. Generally a flaky powder results. Yolks of eggs and whole eggs are dried in this country, while dried egg white is made in central Europe and China. Adding water to dried eggs makes then into a preparation like broken eggs, which may be used for cooking in the same way.

HANDLING AND REFRIGERATION OF FISH PRODUCTS.

We have scarcely begun to utilize our fisheries, while the possible development of poultry raising and egg production is a

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common topic in the popular press. The supply of fish, on the other hand, is literally in sight and may be had for the catching, a process which requires some capital and trained labor, but which is infinitely simpler than the hatching, feeding, housing, and slaughtering involved in poultry raising or the meat industry. One of the greatest difficulties in the way of utilizing our fisheries resources is the ignorance of the American people, especially of the nativ-born, well-to-do people, in regard to the kinds of food fishes, their desirability as foods from the viewpoint of both nutriment and palatability, and the methods of cooking which tend to enhance their food value. Whereas we have done comparatively little to stimulate our fisheries, the older nations have expended, and now are expending, every effort to gather the crops that the waters yield so abundantly, and to deliver them cheaply and in prime condition to their people, not only along the coast, but to extreme inland towns. We have not only our great length of Pacific and Atlantic coasts, but we have also the Gulf of Mexico, rivers, and Great Lakes, sources from which our inland territory may readily be supplied. These waters are practically inexhaustible, if fisht in an intelligent way.

A consideration of the various methods used in catching fish is a fascinating thing, but at this time we are concerned with fish production only as it influences handling and refrigeration. When fish are caught in deep lakes or in the ocean, they are taken either with baited hooks or with seines carried around schools of fish by men in small boats. From Boston there are several steam trawlers operated, which make their catches in nets dragged on the bottom of the ocean on the various fishing banks; also, many fishing boats carrying dories from which the men fish with hooks, bring cod, haddock, etc. Where the fish are transferred to a larger boat before being brought to shore this boat often has trips of several days' duration. Therefore, the fish are cleaned and washt to remove blood, and are then packt in the hold in crackt ice. When the fish are caught in seines, gillnets, or traps near the shore, they are generally landed and then cleaned and packt in fine ice for shipment as fresh fish, or else cleaned, washt and frozen for storage and subsequent

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sale. The cleaning or "gutting," as it is known to the fishermen, is a simple process in which a long incision is made in the fish and the entrails removed. It is customary not to clean certain fish like red snapper, mackerel, shad and herring, while others, like blue fish, cod, haddock and halibut, are nearly always so treated. Cleaning is necessary to secure good keeping qualities in many fish. On the Pacific coast, the staples, halibut and salmon, are usually cleaned, washt and packt in ice, or frozen at once for subsequent shipment to far distant points.

The most important fish in any market are usually those from nearby points, and are generally shipt to the city packt in ice. Most fresh fish are shipt with ice in barrels holding about 250 pounds, with burlap covers, and with holes in the bottom for draining off the water from the melting ice. However, certain fat and tender fish like mackerel and butter fish are shipt in ice water in tight barrels, because the hard ice would damage the stock during transit. More and more fish, especially in the Central West, are being shipt with ice in boxes holding from 150 to 200 pounds, in which the top side boards are extended on each end to make handles and to prevent setting the box on end or in any other position except the upright one. The Pacific halibut and salmon are iced and shipt all over the country in large standard boxes holding about 400 and 150 pounds, respectively. Fish are iced and usually shipt by express when over a day's run from the market, while for shorter hauls the freight or boat service is used. Since fish are provided with a natural waterproof skin, and spend all their lives in the water, the arguments against the shipment of wet packt poultry do not apply with equal force to the shipments of fish with ice.

When possible, fish are iced and shipt for sale as fresh fish because the prices obtained are higher than for frozen stock and the expense of freezing and boxing is thus avoided. It costs about one cent a pound to freeze, box and store fish for the first three months, and this is a great addition to the cost of production in many cases. In the Gulf and Florida districts, fish are all shipt in ice, because during the winter season the demand for fresh fish in the northern cities creates high prices

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for fresh stock, as little of that kind can be obtained in the home waters. It is easy to see why fish will be shipt and sold in the fresh condition at fresh fish prices as long as it can be done. Often, however, the runs of fish are so great in the summer in northern waters that the markets cannot absorb all the supply. Then is the time when fish must be frozen and held for the off season when there is a demand for summer varieties of fish and none to be had in the fresh state.

FROZEN FISH.

The freezing and cold storage of fish is a matter of necessary conservation more than in any other industry, because fish have such specific seasons of plenty. Also, they have the ocean in which to roam, often giving the slip to the watchful fisherman. The fish business is a succession of glutted and bare markets, of very high and very low prices, so were it not for the supply of frozen fish acting as a balance wheel for the trade, we could buy mackerel at a low figure when plentiful in their short season, and none at any price during the rest of the year. Man can control the supply of meat-producing animals, but over the strange migrations and movements of fish he has no power and little knowledge. He must take the fish when they come, for he cannot hold and fatten them like cattle for a rising market.

Any objection to frozen fish would vanish at once if the process of freezing, glazing and storing were better known. To insure a fine grade of frozen stock, the better freezers are now being erected as near the traps or boat landings as can be done conveniently, and the fish are sometimes carried from the boats into the freezers by conveyors. Usually, as soon as possible after being caught, they are gutted (that is, the entrails removed), thoroly washt and laid in shallow pans, heads and tails alternating, until a full pan of 35 to 40 pounds is obtained. These panned fish are then placed on the icy pipes of the freezers, usually at a temperature of below 0° F. After from 12 to 24 hours the fish have frozen solid and form a large cake, held together by the freezing of the thin layer of water between the individual fish when they were panned. By allowing water to

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run on the bottom of the pan and cause slight melting, this cake is then easily removed from the pan. Larger fish like halibut and salmon are frozen separately and not in pans. If the fish were stored in exactly this condition they would shrivel and turn white, owing to the loss of moisture which evaporates even below freezing temperature. This sort of deterioration is prevented by an ingenious process known as glazing with ice, this being accomplisht by dipping the blocks of frozen fish into water, thus covering them with a thin film which freezes at once in a cold room and forms a crystal-clear glaze of ice like a transparent varnish. It is easy to see that this glaze hermetically seals and prevents not only loss of moisture from the frozen fish, but also prevents the entrance of the outside air, which tends to make rancid the easily oxidized oils in the fish. Oily fish or those having no scales, like mackerel, salmon and bonitas, etc., do not take a permanent glaze easily, and for high grade stock such fish are wrapt in a semiparchment paper as well as glazed with ice. Glazed fish may be kept boxt, as is usual in most states where cold storage laws require that the date of entering cold storage be stampt on the package, or else are kept loose in a cold room at 7 to 10° F. for months. When boxt, frozen fish may be shipt any distance in refrigerator cars. The humidity of storage rooms cuts little figure in fish storage, and the temperature is kept at a point that provides sufficient lee-way for a rise in temperature, in case there is any break in the refrigerating machinery of the plant.

The preservation of fish by freezing, glazing and cold storage is a process wonderful for its efficiency and simplicity. The preservation of foodstuffs by canning, salting, or pickling always involves the use of heat and consequent destruction of flavor, as in canning, or else the addition of smoke, salt or vinegar in the other type of product which, of course, has an entirely different flavor after such treatment. Frozen fish stand alone as a food preserved by encasing in a thin, hard envelope of ice, which needs only to be melted to give us back our summer fish almost unchanged in flavor.

It is evident that fish will be frozen only when the supply is

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great enuf to cause low prices in the consuming centers, and also low enuf so that the producer can afford to freeze and carry stock for the higher prices obtained later in the year. Also it is plain that the process of freezing, glazing and storing fish for consumption during the seasons of scarcity is sanitary, efficient and desirable, provided that the fish are frozen at the producing points as soon as possible after being caught. It must be admitted that, in the past, freezing fish has sometimes been used as a salvage process to save from loss those which had been held as fresh stock but had not been disposed of as such. Freezing or cold storage necessarily cannot *improve* any perishable product, but under the best conditions such perishables may be held many months with very slight alteration from the state in which they entered cold storage. The whole matter may be summed up by saying that the proper freezing and storing of high grade fresh fish will produce an article that is good and nutritious food at the end of many months. The people interested in the fish industry understand this perfectly and most of them are now making every effort to freeze only the best of fresh fish for supplying the demand of their winter markets.

Naturally frozen or "winter caught" fish should be mentioned in this connection. On the small lakes of our Northwest and in Central Canada many fresh-water fish are caught in winter thru the ice by hooks or nets and frozen by cold air. Such fish can be recognized by the twisted appearance of their bodies and often by their erect fins caused by their being frozen instantaneously on the ice. In the Maritime Provinces large quantities of smelts are caught in seines and frozen naturally in this same way. As this winter fishing is done when the temperature is below the freezing point, sometimes at —40° F., the fish are frozen almost immediately upon their removal from the water. They are boxt and held on the ice until hauled by teams to the refrigerator cars, and thus shipt to cold storage plants in cities. The unparalleled freshness of these naturally frozen fish, even after months of storage, is a strong argument for the installation of fish freezers as near the source of production as possible.

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SHELLFISH INDUSTRIES.

Each year the United States produces many million dollars worth of shellfish, such as oysters, clams, lobsters, crabs, shrimp and scallops. The two main oyster districts are the New England and New York waters in the North, and Maryland and Virginia waters in the South. Oysters are being produced in considerable quantities in the Gulf, and extensiv new beds have been located on the Texas coast. The Pacific coast produces a small oyster of its own which is marketed there along with the eastern form. Carloads of young seed oysters are shipt west to be transplanted in the Pacific waters and later sold when they have matured and reacht marketable size. For some reason, transplanted Eastern oysters will grow in the Pacific, but do not appear to reproduce there. Clams, both hard and soft, are taken in New England, New York and New Jersey primarily, and they, together with oysters, make up the greater part of the shellfish industry. Small and medium sized hard clams are known as Little Necks and Cherrystones, respectively, and are eaten on the half shell. The larger hard clams comprise the stock sold for frying and for making chowder. The soft or long clams find a market for steaming purposes; steamed clams being a popular dish in several of the Atlantic coast cities.

Lobsters are consumed in large numbers in the United States and are generally shipt alive in crates, by boat, from Maine and Nova Scotia ports to Boston and New York for distribution. These valuable crustaceans were once common in New England waters but have been nearly exterminated by overfishing and polluted waters. However, lobster fry planted in the northern districts are beginning to yield more good lobsters. Hard and soft crabs are produced in places from New York southward, the center of the soft crab business being on Chesapeake Bay, especially at Crisfield, Md., where as many as five carloads of live soft-shell crabs are shipt out on the evening train northwards. Hard crabs are usually cookt by boiling or steaming, the crab meat being pickt out by hand and packt in cans, which are shipt in crackt ice. Scallops as eaten are merely the adductor muscle from the mollusk of that name. The shells

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are opened and this muscle cut out for food, the rest of the animal being thrown away. Scallops are shipt mostly from Cape Cod, Long Island and more southern points in small boxes or kegs.

It will surprise many people to know that practically all of the oysters in Northern waters are cultivated artificially. Cultivation means that the young oysters are allowed to make a "set," or to attach themselves to empty oyster shells on the bottom. Then these seed oysters are transplanted by dredging and laying down in other more favorable places. Sometimes, to encourage good growth, the oysters are taken up and laid down several times before they reach a marketable size in about four years. On the other hand, most of the oysters of the Chesapeake district are dredged off the natural beds during certain months prescribed by law. It is said that the meats of the northern oysters coming from colder water are firmer and make better stock for shipping to distant markets like Chicago and St. Louis, where a higher price is paid for the so-called New York or "northern stock." Oysters are shuckt by hand, washt to remove slime and sand, measured, and placed in one, three or five gallon cans. In the South, these cans are either placed in barrels with crackt ice, or each large can is put in a small square box with room for crackt ice. Car lots go to the Middle West in refrigerator cars, either by express or freight, from both northern and southern points. Northern shippers fill refrigerator cars with hundreds of bare cans of oysters, and then place a layer of crackt ice over the top of these cans, besides icing the car as usual. Refrigerator cars used for shipping oysters are not salted, as well as iced, like meat cars, because of the danger of freezing and thus destroying the quality of the stock, if the temperature goes below 28° or 29° F. Oysters on the half shell have to be considered, but they are a luxury because of the cost of selecting and serving fine stock on crackt ice. However, many oysters in the shell are transported during the cool months, packt in barrels, which are headed up or covered with burlap tops. Obviously, shuckt oysters are cheaper to ship and are more easily handled in cans than are the barrels of shell stock consisting in great measure of heavy, useless shells.

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When oysters are taken from the ocean and placed in brackish water, they absorb water and increase in volume, this process being known as floating. The flavor is certainly not improved in this way, but the bulk is increast, thus making it a profitable operation. The federal government, sometime ago, ruled that floated oysters constitute a food adulterated with water, which the consumer buys at oyster prices. The floating process as such has been discontinued, but the *prolonged* washing of shuckt oysters gives much the same sort of increase in volume. Moreover, it is illegal to ship shuckt oysters with ice floating in them for refrigeration, because they would absorb the fresh water from the melted ice and increase in size. Shuckt oysters are now kept cold by ice from the outside of the cans, and a better flavored product is obtained. These federal laws do not affect the retailer, who often adds water to his oysters to increase their bulk and give them a plump appearance. Some cities, like Philadelphia, prefer floated oysters because of their plumpness, rather than the salty flavor of the natural oyster. Scallops have been shipt in kegs with fresh water, which was absorbed in transit, producing an increase in volume similar to that in the case of oysters. This practice, too, has been declared illegal for interstate shipment, and will probably soon be abandoned. Scallops which have been shipt dry are smaller, but have a much more attractiv flavor than stock which has been treated with fresh water.

The federal and several state governments are now making extensiv sanitary surveys of oyster beds with a view to locating any possible contamination with sewage from neighboring cities. The vext question of whether oysters may produce typhoid fever or not is still undecided, but an ordinary regard for cleanliness demands that filth shall not touch human food, whether in the water or on land. Oysters having over a certain number of bacteria of the intestinal type may not be shipt in interstate commerce, and also certain states forbid the sale of oysters from beds found by their experts to indicate possible contamination. The floating of oysters and the addition of dirty ice for cooling them once lowered the sanitary standard of oysters, but this is

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uncommon; they are now a very wholesome and desirable food. Fresh oysters properly packt and iced may be shipt long distances, even as far west as Denver, and still be palatable if sufficient care is taken.

TRANSPORTATION OF POULTRY AND FISH PRODUCTS IN GENERAL.

Essentially the transportation of commodities adds to their value by the act of taking them from the locality where they are produced to the place where they are consumed. The time that is required in transit is not an important factor in the transportation of coal, lumber and similar things, which are not affected by temperature or weather conditions. On the other hand, it is easy to see that perishable commodities like meat, eggs, fish, fruit and vegetables must not only be moved, but they must be moved *rapidly*, and at the same time, be protected from heat in summer and cold in winter; this is the function of the insulated refrigerator car. In some cases, like bananas shipt northward from New Orleans, the refrigerator cars start their journey with ice in their bunkers, and arrive at the northern points artificially heated by alcohol or oil stoves.

In the case of poultry, eggs, fish and oysters, it is the effect of heat that is most feared, so refrigeration is applied. To maintain refrigeration between the far distant source of supply and the consuming center, we have developt a system of refrigerated carriers in connection with our transportation lines, and we are as dependent upon them for our perishable food supplies as is England upon her ships. The traveling public everywhere is familiar with the appearance of the outside of the freight car which bears the word "refrigerator," as well as the initials of its line, but few know anything of its construction, or its function in our transportation system. There are over 100,000 refrigerator cars in the United States, slightly over half of which are of private ownership, like Armour and Pacific Fruit Express cars. It will surprise many people to learn that somewhat like the owners of Pullman cars, these refrigerator car lines usually receive about a cent a mile per car from the railroads which haul them. In its simplest terms, a refrigerator car is an ice box on wheels with

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layers of felt or similar insulating material in its walls, and receptacles or bunkers on each end for holding several tons of ice, which is put in thru hatches on the roof of the car. The cars are re-iced in transit at various so-called icing stations. Salt is almost always used with the ice in meat cars, often with drest poultry, in order to make sure that the commodity is not at any time warmed above the point at which decomposition is rapid. Poultry and eggs are shipt from the Middle West in refrigerator cars; halibut and salmon from the Pacific; oysters from Long Island; apples from Oregon; oranges from California and Florida; peaches from Georgia; cantaloupes from Colorado. So great is the present demand for perishable commodities of all sorts, and so great is the distance of the cities from points of production, that our present well stockt markets are wholly dependent upon the refrigerator cars and fast freight service.

TRANSPORTATION OF DREST POULTRY AND EGGS.

In the discussion of the handling of poultry and eggs, they were left in the cold room of the plant awaiting the arrival of the refrigerator car which is to take them to some eastern or far western point, usually over a thousand miles away. It is heat that we must guard against when these products are shipt. So the careful packer asks the railroad to place the iced refrigerator car on his siding at least 24 hours before he expects to load, for no packer who is properly interested in preventing decay ever loads his goods in a car having a high temperature, or hauls chilled goods in open wagons if he can help it. The loading of a car containing 20,000 pounds of poultry or eggs can be accomplisht in thirty minutes if the work is well planned. It should be done as expeditiously as possible to prevent a rise in temperature of the air in the car. Even with prompt loading, it is well to have a very heavy canvas curtain hung in the door of the car to keep the outside air from entering, and only one door is ever opened at a time to lessen the danger of circulation of warm air.

Having loaded the car and again observed the temperature, that the packer may know exactly under what conditions his

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goods start on a long journey, the door is closed and sealed. The railroad agent knows the perishable character of the freight, and he issues instructions to ice while in transit, that low temperatures may be maintained. Drest poultry should be shipt at from 30 to 35° F. to insure arrival in first class condition. Frozen eggs in cans are extremely perishable, and they should also be kept at below 30° F., the same temperature as frozen poultry. Eggs in the shell may be shipt at 40° F. and no salt should be used when icing the cars, for fear of freezing and ruining the eggs. The condition of the car is determined before loading by means of thermometers, which give the temperature at different points within the car. The manner of stowing the boxes of poultry has a great deal to do with the circulation of the cold air from the ice in the bunkers. The best plan is to load so that there are spaces between the boxes lengthwise of the car, and to be sure that the boxes are not loaded too close to the bunkers for fear of preventing free air circulation. When poultry is shipt packt in barrels with ice, such care in loading is not necessary as the ice itself provides refrigeration.

The fragility of the egg shell makes another serious problem besides that of refrigeration, for the shipper of eggs and for the carrier who has to pay claims for damages caused by breakage in transit. Each case of eggs consists of thirty dozen, each egg being in its own compartment made by the straw board filler, and looking very secure in this position. However, the bumps received in loading and those due to the starting and stopping of trains, together with those received in unloading, all help to break the shells. In loading a car of eggs the cases must be stowed with two objects in view; one to prevent breakage by the shifting of the load, and the other to secure air circulation and consequent refrigeration from the ice bunkers at each end of the car. Research shows that breakage in transit may result from improper arrangement of cases in the loading and improper bracing and buffing. The bracing consists of boards or small pieces of timber nailed in among the egg cases to prevent shifting, while the buffing of lumber or straw is used to take up the excess space between the cases themselves, and between the cases and the

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car walls. Naturally, much straw would have to be used and greatly comprest in order to make it efficient for this purpose. Rough handling of cases and the custom of walking on them after loading are two forms of damage that only personal instruction will prevent. Thru the co-operation of the government, the shippers and railroads, all these matters have been discust and already the greater care in handling, stowing and bracing have made great reductions in the amount of eggs damaged in transit.

TRANSPORTATION OF FISH AND SHELLFISH.

There are two ways in which fish are transported; one is by express and fast freight for fresh stock, and the other is by freight for frozen fish. When in the frozen state, eastern fish are shipt in wooden boxes holding from 150 to 200 pounds, in which the cakes of frozen fish were placed for cold storage. These shipments of frozen stock are made during the cooler weather in refrigerator cars and under such conditions fast railroad schedules are not necessary. Unlike eggs, fish either frozen or fresh cannot be broken during transit, nor are the frozen fish liable to great fluctuation of temperature, because they maintain their refrigeration, being in large masses, packed in boxes, and coming from rooms as cold as zero degrees. Fresh fish are packt for express shipment either in barrels or large boxes filled with crackt ice, which slowly melts and drains thru the bottom of the container. Fresh fish under ice may go by express either in ordinary or in refrigerator cars. Between Maine and Nova Scotia ports to Boston there is an extensiv business of transporting iced fish by boat service. This is also true to a less extent between Boston, New York and other Atlantic coast points. In certain of the ocean steamers and those running between Alaska and Pacific coast points, there are refrigerated compartments for fish and other perishable commodities. During all the year an enormous quantity of fresh halibut and salmon is sent in refrigerator express cars, packt with ice in large boxes, to the farthest parts of the country. From the Pacific to Atlantic cities the run is made in five or six days, and the express

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charge adds about three cents per pound. Frozen halibut and salmon travel in the cooler weather in refrigerator freight cars, taking from two to three weeks for the trip at an expense of something over $1^1/_2$ cents a pound. Considerable quantities of iced fish are shipt from Boston and San Pedro, etc., in all directions, by the electric express service furnisht by the suburban trolley lines radiating from these cities. For the first and second zones of the parcel post system, this mail service may prove useful in carrying fish during the cooler weather, if some sort of odorless, waterproof container could be devised so that the fish would not damage the other merchandise.

Live oysters in their shells are shipt in barrels, as already mentioned, and require no refrigeration during the relatively cool weather of the oyster season. During shucking, the shell, which is the protectiv covering of the oyster, is removed, and they thus become an extremely perishable commodity like broken and frozen eggs. Cans of shuckt oysters are as easily handled as cans of frozen eggs, but like the latter, require very efficient refrigeration during transit. Chemical research has shown that the lower temperatures greatly retard the deterioration in oysters. Hence, it is evident that adequate refrigeration will prevent losses on oyster shipments. At present, most car lots and smaller lots of shuckt oysters are shipt west by express from the New England and Chesapeake cities. When the cans of oysters are sent in car lots, they are previously precooled by holding for some hours in the chill room and are then packt into refrigerator cars and over them a layer of ice is scattered, and the car is sealed for its journey of something over a day if by express to Chicago or St. Louis, or over two days if by fast freight to these cities. When smaller lots are shipt, the cans are packt in boxes with ice and are re-iced by express employees in transit. By fast schedules and comparatively low rates the express companies have obtained most of the shuckt oyster business from the railroads, whose freight service lacks the speed of the express, except in certain cases where the railroads run their fish cars from the Pacific coast to Chicago on passenger trains and charge about twice the usual freight rate.

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PERISHABLE FREIGHT SERVICE ON THE RAILROADS.

Before leaving the subject of the transportation of poultry and fish products, something should be said of the way in which the railroads handle the enormous traffic of perishable freight in refrigerator cars on fast schedule. These cars are generally iced and salted 24 hours before they are expected to be loaded by the shipper and are then set on his siding. Before loading, the temperature of the center of the car should be below 40° F. To maintain this low temperature only one door is opened and the loading is done thru a canvas curtain hung in the open door. These precautions are necessary to prevent the escape of the cold air in the car. As soon as loaded, the doors are closed and sealed, the car not being opened again on its long journey. The ice bunkers, of from two to three tons capacity, are filled thru the hatches on the roof of the car. Each car is hauled to the next place where others are waiting, and soon enuf for a train are pickt up, and then from some central point a thru train of refrigerator cars is made up of them. Less than car lot shipments are pickt up from place to place and are finally collected at a transfer or concentration station, where they are made into car lots, loaded in cold refrigerator cars and combined with other similar cars to make a perishable freight train. Such trains of perishables run thru to destination, if possible, without being broken up, and have a schedule averaging about 18 or 20 miles an hour. Also, such trains are given preference over other freight, and to avoid delay, are kept out of switching yards at all division points, as far as possible. Meat trains are given the right of way over all other freight, and then come the "preference" or "time freight" trains noted above. On some roads, these trains have a distinguishing symbol consisting of a red ball or a red cross, and this easily discernible mark appears on the destination cards tacked on the sides of the cars. This enables every employee to know the perishable nature of the load in that particular car, so that he may use every means to expedite its movement. In making up such trains, only enuf cars are added to equal about 60 per cent. of the tonnage rating of the locomotiv assigned to that train, thus making certain that there will be no

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delay on the road. Trains of perishable stuff travel on a schedule as definit and as fast as some of the passenger trains. No stops are made except at division points to change engines or at icing stations where several tons of ice are delivered to the bunkers in each car in a very few minutes, often by a conveyor system. On the receiving end, these cars are rapidly delivered to the consignee, or else placed in terminals or piers at his order. Sometimes cars are diverted in transit, when the owners of the load have reason to believe that better prices may be obtained at some other than the original destination. It is easy to see that during a dull market the consignee may wish to hold his perishable goods in the refrigerator car as long as possible, and so avoid the expense of carting and placing in refrigerator rooms. Naturally, this tends to make a congestion of cars in certain places at certain times, and the railroads make a heavy demurrage charge on refrigerator cars, in order to discourage this tendency on the part of the consignee to use refrigerator cars as storage warehouses.

By a new arrangement, the railroads quote a rate for perishables which does not include initial icing or re-icing in transit, this being paid for by the consignor at a given rate per ton. During the warmer months, both the express and the freight rates often make an allowance of from 20 to 25 per cent. of the gross weight on smaller shipments when ice is used for purposes of preservation, as in the case of barrels of fish shipt with ice, and so on. The rates for refrigerator express service are often high, as these cars often run on passenger trains, thus giving the shippers the maximum promptness of movement; also an attendant sometimes goes with express cars to provide for reicing in transit, etc. The rates of both freight and express services, and their icing charges are regulated by the Interstate Commerce Commission, so there is not so much a competition of rates in these days as a competition in service, such as providing well insulated cars, fast schedules, terminals near the market district in cities, etc.

CONSERVATION OF POULTRY AND EGGS.

Among the many problems now facing municipalities none is more fundamental to peace and prosperity and none is more

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complex than is the question of the food supply. To the person trained to observe and eliminate waste, the spoilage of foods between the producer and the consumer assumes the proportions of a public calamity. Also, to a person so trained, good handling, beginning at the source of production, refrigeration during transportation, and, finally, refrigeration at the market with distribution expedited by adequate facilities for the work to be done, means not only the saving of vast quantities of perishable products that are now absolutely wasted, but an improvement in quality of all grades, even what are now the best.

In the poultry packing industry, the best practices in handling and transportation result in a great saving of foodstuffs formerly lost before reaching the market, and also result in a higher grade product on the retailer's stand. This is true conservation. The wider adoption of the most sanitary and careful handling means a great money saving to all the people. The time is coming —and coming faster than a cursory observation would indicate— when the dirty, watersoakt, half decayed, wet packt chicken will be a thing of the past. Indeed, the dry packt chicken of to-day, generally handled for prompt marketing between 30°–40° F. will be hard frozen twenty-four hours after killing and so shipt to market and so carried, even to the kitchen of the housewife, who will thaw it in her own refrigerator before preparing it for the table. Some of the more progressiv packers are refusing to ship drest poultry in warm weather unless the customer will take it hard frozen. Very often the customer dealing with the packer prefers it so, but he is handicapt because the consumer insists that it is "cold storage" and demands a "farmer's chicken that is fresh"—and she gets the thawed companion of the frozen bird, which may have deteriorated in the hands of the retailer and will deteriorate every hour that it is in her possession. As usual, ignorance and prejudice conduce to the disadvantage of all concerned.

As we gain a deeper insight into the effect of small variations of temperature on the rate of flesh decomposition the need for low temperatures in the handling of perishable produce and the quick response which a rise of even a few degrees calls forth in

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the form of undesirable results, impresses one forcibly. Like every other good thing on earth, refrigeration can be abused. It is to the ultimate welfare of the industries employing low temperatures in the handling and conservation of foodstuffs to see that no abuses occur. It is just as conduciv to the welfare of the consumer that he acquaint himself with prevailing conditions, face facts honestly, and then choose deliberately, either to return to the restricted diets natural to the varying seasons and different localities, or to accept intelligently the great variety of foods—both geografical and seasonal—provided by refrigeration and the use of long-continued low temperatures designated "cold storage."

We have seen what care is necessary in handling, packing and cooling eggs to prevent great losses from incubation and decomposition favored by heat, and also to prevent mechanical breakage from rough treatment in loading and in transit. In the producing sections, eggs should be bought on a quality basis as determined by candling, and not by the case count, which means a low price for the good and bad eggs together, based merely on the number of dozens. Furthermore, the shipping of fertile eggs can be reduced to a minimum with consequent great saving of eggs, which would otherwise incubate, even in a short time, under high summer temperatures. Proper stowing of cases in cars and careful loading are real factors in conserving the egg supply. The application of refrigeration to eggs is, from an economic viewpoint, even more important than is its application to drest poultry because eggs have become an almost universal food in homes of rich and poor alike. About ten per cent. of the eggs produced are lost by bad handling before they reach the consumer. A much greater proportion deteriorate in quality and, consequently, in money as well as food value. The deterioration begins on the farm with the carelessness of the farmer. It is aggravated by the hot storeroom and by the long holding of the country merchant, and continues while the eggs travel in box cars to the shippers—a few cases at a time—and even beyond him to the city, unless he is provided with mechanical refrigeration and ships under refrigeration. The early spring eggs that reach

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him before warm weather are almost universally fresh. By applying refrigeration continuously and promptly he can retard deterioration to such an extent that the egg is still edible at the end of nine months.

For eggs that are small, dirty, or cracked, the process of breaking and freezing offers an outlet that is rapidly gaining in favor in the cities, and will help to save for food purposes the large amount of material otherwise wasted. The same argument applies to dried eggs. Great care must be used to obtain the most careful elimination of eggs unfit for food and to see that the greatest cleanliness is observed in a breaking room. When these requirements are met, frozen and dried eggs are a wholesome food and represent a distinct saving of a valuable commodity.

CONSERVATION OF FISH FOODS.

In the fish and shellfish industries, certain opportunities for improvement exist and, fortunately for these industries, no one is better aware of this fact than certain of the people in the business. In every city, there are a few progressiv men who are far-sighted and frank enuf to realize that many undesirable practices need to be eliminated, in order to make the fish industry develop to the extent that is justified by its importance. A keener realization of the extremely perishable character of fish, especially in the warm weather, would prevent great losses to all concerned. The fish freezers should be as near the point of production as is possible, in order to secure perfectly fresh fish for freezing and storage. The producer who ships his fish with insufficient ice and the retailer who does not have his fish on ice every minute are equally short-sighted and must expect to suffer losses continually. The fish producer is often made to realize, by the wholesaler who handles his stock, the futility of economizing on ice in his shipments, while the retailer must also be taught by sad experience that the consumer will not buy tainted fish. All fish and oysters should be thoroly chilled as soon as possible and kept chilled for some time before shipment, in order to save refrigeration in transit, as well as to prevent any deterioration before shipment. The wholesaler is learning the

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necessity for more care in handling a commodity as perishable as fish, and consequently the quality of fish sold is improving. Also, the conscientious dealer no longer thinks of freezing fresh fish already exposed for sale. At times, unscrupulous dealers have tried to save such fish by freezing, but it is plain that fish frozen in poor condition cannot compete with stock which was fresh when frozen. The retailer trying to do a one-day-a-week business too often buys fish when they are cheap and holds them under insufficient ice until "fish" day comes again. This results in a tainted product which prejudices many people against fish in any form. Another reprehensible practice is that of buying frozen fish, thawing them and selling to the consumer as fresh fish at correspondingly high prices. This is unfair to refrigeration in general, which, properly used, means a saving and not an opportunity for unjust profits. Also, the retailer is injuring the fish industry as a whole by the common practice of having standard prices for certain fish, since he makes no effort to allow the retail prices in his market to follow the wholesale prices as they fluctuate from day to day. The large department stores are doing a very good work in keeping fish in ice under sanitary conditions, selling fish every day instead of on fast days, and allowing their prices to fluctuate with the wholesale prices paid. In time, these department stores will help educate people in the proper care, use and prices of fish, and this will ultimately mean a great deal for the fish industry.

In the shipping of fish and shellfish, a greater use of standard containers would be a great saving, because the increast uniformity would enable the railroads to make better rates, and this uniformity would also reduce the labor of keeping accounts. The halibut and salmon boxes from the Pacific districts are uniform in size, and also the boxes for holding frozen fish in storage in the Atlantic coast districts are slowly being made uniform. This needs to be done in the case of barrels and boxes for shipping fresh fish with ice. A box of standard size with projecting side boards for handles and to prevent placing in any other than the proper position, would save much time in handling, as well as give a much better basis for making favorable shipping arrangements

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with the carriers. An oyster package of standard size and shape would have the same effect in that industry.

The education of all shippers of fish and shellfish in the matter of using ample refrigeration, whether in the form of adding ice to fish in small lots, or icing car loads, would insure the arrival of the perishable commodity in good condition and result in a saving of food to the consumer and money to the shipper.

The conservation of foodstuffs is even more fundamental to the welfare of our people than the saving of forests and minerals. It behooves us to study the problem carefully and to utilize every means that ingenuity can devise to save all that we raise. Among the most important means to this end is refrigeration; and when refrigeration is combined with an intelligent application of the facts that scientific investigation has shown to make for stability in perishables, the questions of distance from the consumer, decay at the market center and waste during the season of overproduction will very largely lose the menace they now hold.

DISCUSSION.

E. H. Webster, General Superintendent of the California Central Creameries, San Francisco:

The subject which I am to discuss briefly this morning is one of the most important with which we have to deal in the whole question of the economics of the home. Good dairy products begin at the farm and by a like method of reasoning bad products begin there also. We must have a clean healthy cow and a clean healthy milker. From the time the milker begins to draw the milk to the time it reaches the consumer the question of sanitation is of utmost importance. If the cow or the milker are not healthy the milk may be dangerous. Contagious diseases of many forms may easily be transmitted thru the milk and the children will be the ones to suffer.

I will not discuss the details of sanitation, for this subject is well covered by the literature of dairying and is well known to most physicians.

The transportation of milk under proper conditions is of vast importance and is not given enuf consideration by transportation companies. This is a commercial problem that has to be solved. It is frequently the case that refrigeration is not supplied by transportation companies for the reason that the cost would be greater than the rates would bear. The consumer needs and must be provided with better dairy products but he must at the same time be willing to pay the extra cost that it is necessary to incur in making them better. The influence of refrigeration in transit or the lack of it has not been

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given sufficient consideration by sanitarians and health authorities, particularly with reference to milk and cream. Good refrigeration is very essential. It should begin as soon as the milk is drawn from the cow and continue, except during processes of manufacture, until the finisht product reaches the consumer. One of the neglected places in the course of milk movement is the farm. Quick and thoro cooling is not regarded with enuf concern. We have much difficulty in the interior valleys of California because of high temperatures of air and water to sufficiently reduce the temperature of milk or cream so as to insure safe transit to market. Under these circumstances it is essential to employ extreme care in handling on the farm. It is altogether probable that the best solution is to bring the factories for the manufacture of the product close to the farm and put them in transit to the city only after they have been pasteurized and properly refrigerated.

Pasteurization is becoming almost universal and it is a good thing. Much of the prejudice against pasteurized milk is disappearing for the reason that systems have been workt out which do not destroy the quality of the milk. For drinking purposes milk that has been heated to 140 to 145 degrees for 25 minutes is proven acceptable in most all cases and such milk does not convey the organisms of disease.

We are gradually adding safeguards which will make it possible to supply the public with clean, wholesome dairy products, and of such nature as to satisfy our palates and give safety to the purchasers.

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THE RELATION OF THE TRANSPORTATION AND STORAGE OF FRUITS AND VEGETABLES TO THE CONSERVATION OF THESE FOOD SUPPLIES.

By A. V. STUBENRAUCH, Professor of Pomology in the University of California; Consulting Pomologist of the U. S. Department of Agriculture, Berkeley, Cal.

INTRODUCTION.

In the discussions given in this paper, the relationship of the various factors coming under the designation of transportation and storage will be included so that the scope of the paper may perhaps be broader than at first sight seems apparent. Detailed descriptions of the various processes of packing, shipping, transporting and storing fruits and vegetables will not be attempted, except as these descriptions may be necessary to give a full understanding of the factors which influence and govern the supply, and the successful distribution of the crops to the end that consumers in the various markets of the country, or of the world, may be able to obtain a sufficient supply of these necessities in the human diet.

When I was requested to prepare a paper upon the topic of the "Transportation and Storage of Fruits and Vegetables" for a congress of physicians, the first question which arose in my mind was in what ways could the interest of the physician be gained in a discussion of this subject. Unless there was a specific object in view and some specific purpose to be gained, it was felt that a discussion of the factors of transportation and storage bearing upon fruits and vegetables might fail to enlist the interest of medical hearers. I believe there are topics in the handling of fruits and vegetables which not only should interest those of the medical profession, but I can see where a distinct service can be given by showing, in a very elementary manner perhaps, how the methods used in preparing fruits and vegetables for shipment and in distributing them among the various markets have an important influence upon their quality as well

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as upon the supply available for consumption. We, of the laymen not versed specifically in medicine, hail it as a distinct advantage, and if I might be allowed to say it, a hopeful indication that a body of physicians should give a place on their program for a discussion of the factors underlying the successful distribution of food supplies. I am not here to discuss that fase of the subject; but I cannot refrain from expressing satisfaction over the fact that such prominence is given a topic of this kind.

Somebody has said that the best way to obtain and conserv good health is right living. "Right" living may include a number of things, but I think all are agreed that the most important factor of all is a proper diet, using the term "diet" in its broadest sense. It is frequently necessary for the physician to prescribe a specific diet to overcome or to avoid certain ailments which are very often the result of over-indulgence in certain classes of foods known to be unwholesome or objectionable. The fully qualified physician must then have a wide knowledge of the composition of various food materials and their functions in digestion and nourishment. In these cases the function of the physician is to repair some damage which has occurred. The modern physician is extending his province. He is becoming a missionary in the field of right living, prescribing not only medicine and drugs, but proper regulation of habits, of physical activities, of food and drink. We need his advice to enable us to avoid the damage—to avoid the wrecks along life's right of way—his aid is necessary in our "Health Safety First" campaign. Looking at the matter then from the broad standpoint of the public health, we are interested in the large questions of supply and the problems of so distributing food materials that sufficient quantities of the right kinds of foods shall be within the reach of the masses of consumers at all times.

THE VALUE OF FRUITS AND VEGETABLES IN THE DIET.

The assumption that fruits and vegetables have a valuable place in the human diet is accepted. It seems unnecessary at this time to offer evidence in support of the accuracy of this as-

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sumption. The value, or more strictly speaking, the necessity of the free use of fruits, nuts and vegetables is fully recognized by all dieticians. But it has not been many years since the use of fruits was considered as a luxury instead of a necessity. Campaigns of educational advertising have been made which it is true had for their main object the increase of the use of fruits primarily in order to enable the profitable marketing of the increast production of fruit crops. While the increase in the consumption of fruits has benefited the producers, the consumers are also receiving fully as much benefit, because I believe we are all agreed that the increase in the use of fruits in the diet, especially by our large population of city dwellers, is greatly to be desired. There is an old saying, for example, that "An apple a day keeps the doctor away." Wide use has been made of this catchy frase in advertising literature. At first sight one might suppose that the furtherance of this doctrine would, if true, not find favor with such an audience as this. But we are considering you as conservers of the public health instead of mere restorers of health.

We should not then look upon the use of fruits as luxuries; neither should we use them for medicinal effects, as is often urged. Fruits are foods, supplying to a very great extent some of the important body-building and energy-producing elements. In addition, valuable necessary mineral substances are supplied in easily assimilable form thru the medium of fresh fruits and vegetables. The proportions of some of the mineral substances which the body requires are more abundant in fresh fruits and succulent vegetables than is the case with most other foods. A serious lack of these mineral substances for a considerable length of time may result in serious disease. Scurvy, which was so common on old sailing vessels, using a diet made up largely of bread and salt meats, is an example of this. It is well known that the free use of green vegetables, potatoes, or other fresh fruits and foods prevents the occurrence of scurvy.

In addition, fruits and vegetables supply large volumes of roughage and non-absorbable materials, which are helpful in digestion and in stimulating intestinal action. Another factor

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is the variety of flavors, which give zest to the appetite and further aid in promoting a more healthy and wholesome action of digestion.

From all standpoints, we can accept the dictum that the extension of the use of fresh fruits and vegetables is beneficial to mankind and therefore worthy of encouragement by those interested in the welfare of the people.

It is undoubtedly true that the complete substitution of a fruit and vegetable diet for a mixt diet must be very carefully considered. There is valid reason for believing that a sudden change from one form of diet to another might result harmfully in many cases. It would not be reasonable to suppose that an individual who has been accustomed to a mixt diet composed largely of the more concentrated foods thruout life could change abruptly to the less concentrated fruit and vegetable diet without experiencing some difficulty and even ill effects. There can be no doubt that one can become accustomed to the less concentrated foods as represented in fruits and vegetables, especially if begun early in life. The writer has a son who thru choice, from babyhood, has subsisted almost entirely on a fruit and vegetable diet. He is now approaching young manhood, has always had excellent health and is a strong, well developt youth.

Along with the acceptance of the doctrine of the increast use of fruits, we should also accept the dictum that fruits could with very great advantage replace the large use of sweets, pastries and such foods which are likely to cause serious digestiv troubles.

But a discussion of the uses of fruits and vegetables as foods is not the burden of my paper. There are undoubtedly others here who are much better qualified to discuss this important topic. From what has been said, we have justified fully the assumption that the extended use of fruit and vegetables is beneficial; therefore, the factors which are fundamental in providing a continuous supply of these wholesome foods in sound condition and within easy reach of the masses, should be of considerable interest. It is a well known fact that green vegetables are very abundant in the United States and Canada, and while

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in season are comparatively inexpensiv. There is apparently a greater use, and a more common use of these in this country by families of all circumstances than in most other countries. This is a certain advantage. It will be the purpose of this paper to indicate some of the fundamental factors which have rendered possible the greater and freer use of fruits and vegetables by our people. The part that efficient transportation and storage are playing in this important fase of our lives will be pointed out, as those factors are, more than any other, responsible for the cheapening and placing of fruits and vegetables within the reach of the common people. The discussion will be confined to fresh fruits and vegetables. Dried, conserved, or canned foods may be shipt successfully over long distances without special shipping appliances to maintain them in wholesome condition. Such foods may be sent by slower and cheaper means of transportation and only ordinary warehouses are necessary, as a rule, to hold them for distribution. For the successful shipment and transportation to market of fresh fruits, special equipment in the way of packages, refrigerator cars and comparatively rapid transit are necessary, and refrigerated warehouses or cold storages are necessary to conserv and hold them while awaiting distribution.

EXTENT OF FRUIT AND VEGETABLE INDUSTRIES OF THE UNITED STATES.

The value of the fruit and vegetable crops of the United States, according to the last census, reacht the stupendous total of $640,000,000, a sum more than twice the cost of the Panama Canal. These industries are growing rapidly and the territory supplying these tremendous crops is widely scattered. It happens that many of the lands specially adapted for the production of high-class fruits and vegetables in large quantities are located at great distances from the centers of consumption, or the industrial centers, the population of which constitute the great bulk of the consuming masses. Some crops can only be grown under special conditions existing in certain localities due to climatic or other causes. Thus most of our oranges and grapefruit are produced

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in California and Florida; olives and lemons only in California; figs in California and in certain sections of the South; grapes may be grown only in certain sections, and the European type of grapes practically only in California; the production of apples and peaches, altho widespread, is limited to certain sections of the country. This list might be extended to great lengths, but the examples mentioned serve to illustrate the point.

We have not yet reacht a point in the development of our fruit industries where only the crops or varieties best adapted to certain districts are produced in those districts. It is true that there has been and there still is considerable haphazard plantings of crops, resulting, in many instances, in the planting of orchards on lands or in districts not adapted to the highest production or the most economic operations. This means that eventually plantations located in unfavorable places will not be able to hold their own when competition becomes very close. Efficient transportation service, which is available at a reasonable cost, will perhaps be the most important regulator of these mistakes. Changes are bound to take place, so that gradually each district in the country will produce the crops which it is best adapted to produce and which, therefore, it can produce most economically. Mistakes in the planting of annual crops are serious enuf, but they are not nearly as serious as mistakes in the planting of orchards. With annual crops the planter has the opportunity to change from one crop to another without great difficulty, and failure with one does not necessarily mean permanent disaster. An orchard planting, however, is a long-time investment, requiring in some instances ten to fifteen years to reach its full profit-yielding stage. While it is possible to change from one variety of fruit to another or even from one kind to another in some instances, there are limitations in this respect, and under the best conditions, these changes require years to accomplish. The greatest care, therefore, is necessary in the selection of sites for orchard plantings, in the selection of the kind of fruit and after that, in the selection of the variety to plant in a given locality. The planting of an orchard is a serious undertaking, the investment a long-time one, and no man

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can afford to engage in this work unless he has a full knowledge of the great fundamental factors involved.

Perhaps these remarks may seem out of place here and not bearing on the topic under discussion. I confess they are somewhat out of place, but I cannot allow the opportunity to pass without calling attention to the importance of this fase of the matter. There has been going on in the United States during the past few years tremendous developments of orchard planting schemes. This movement has not been confined to any part of the country; it is going on in all parts where there is any excuse at all for fruit-growing. Most of these schemes are designed to induce city people in various walks of life to purchase tracts of different sizes, usually small, which are to be planted and cared for by the corporation responsible for the development. The plan generally in vogue is to sell on the installment plan, the plantation to be turned over to the purchaser at the end of five or six years, when it is supposed to have reacht a profitable stage. The purchaser then must either manage the plantation himself or he must hire it done. In either case, there is great doubt whether the plantation will be properly handled. In the first place, the owner is usually wholly unfamiliar with the requirements of orchard management; in the second instance, which is usually the plan of management followed, he is dependent upon others. This kind of farming has been named "proxy farming." We have yet to find one example of the success of this class of farming, especially orchard farming or fruit-growing. It is wrong in principle as far as the profitable production of crops is concerned. The originators or promotors of the work depend only upon the sale of the land for their profit; they are not primarily interested in the production of crops—are not dependent upon crop production for the success of the venture from their standpoint. Many of these promotion schemes are honest, altho doomed to failure; their originators have simply been mistaken in judgment. Others, and unfortunately there are many, are dishonest and are simply designed to unload cheap and unproductiv lands upon an unsuspecting public.

This does not mean that horticultural or fruit-growing indus-

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tries are not profitable fields for investment. The stock of a number of well managed fruit-growing corporations is yielding excellent returns for its owners. These corporations are organized with a view to producing crops and depend upon the production of crops for their profit. Purchase of such stock is in no way similar to the purchase of land from a promotion company organized solely for the purpose of obtaining abnormally high profits from the sale of the lands and upon the development work itself.

THE INFLUENCE OF EFFICIENT TRANSPORTATION AND REFRIGERATION SERVICE.

The development of efficient transportation with refrigerator car equipment together with cold storage is the most important factor in the development of our fruit-growing enterprises on the gigantic scale of the present day on the one hand, while on the other, it is the one great factor which has enabled the large masses of city population to obtain supplies of these essential food products at reasonable prices, in large and constant quantities. The large increase of our city population has rendered these dwellers more and more dependent upon outside sources for their supplies of foods. The building up with city and suburban homes of the districts contiguous to large cities has greatly reduced the means of producing any considerable proportion of the supplies of fruit and vegetables near at hand. Indeed, it may be considered doubtful whether the development of our large cities with their teeming millions of population wholly out of contact with the soil could have been at all possible without efficient systems of transportation to bring in food supplies from a distance. In the old days the town districts were entirely dependent upon adjacent surrounding country or districts within hauling distance for their supplies of fresh foods. Out-of-season vegetables and fruits had to be stored at home or use had to be made of canning or preserving processes.

The introduction of the modern refrigerator car, together with the extension of rapid transportation service, and the modern cold storage warehouse have changed the old practices of home or nearby supplies and now-a-days very large proportions of our

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cities' supplies are obtained from considerable distances. This has made possible the shipping-in of products during seasons when local supplies are not available, thus enabling the city dwellers to obtain more uniformly and constantly abundant supplies. The time was when the supply of certain fruits and vegetables in a given place was limited to the local season of production. Now our large markets draw their supplies from all parts of the world, so that the seasons of all food commodities are very materially lengthened. Efficient transportation and refrigerator service have made possible the utilization of lands eminently adapted to the production of certain crops on a large scale. The development of the large fruit-growing industries of California, the Pacific Coast or the mountain districts, or the great fruit and truck-crop industries of the South would not have been possible otherwise. The refrigerator car has brought the large markets of the Atlantic seaboard within comparatively easy reach of the Pacific Coast producer. It has brought products of the southern truck-gardens to the doorstep of the northern markets. This has meant the development of fruit-growing upon a tremendous scale not only in California and other Pacific Coast states, but in other sections of the country specially adapted by climatic or other conditions for the production of different crops.

NECESSITY OF REFRIGERATOR TRANSPORTATION AND COLD STORAGE.

Refrigerator transportation service and cold storage are actual necessities to the producer of fresh fruits or vegetables in order to carry his crops to market and to distribute then economically. These agencies of transportation and storage are also urgent necessities to the great mass of consumers in enabling them to obtain at all times sufficient supplies of wholesome fruit and vegetable foods. The distant growers are enabled thereby to deliver their products at the door of the consumer.

The fundamental factors governing the selection of a site for a fruit plantation are three:

(1) Proper soil conditions;
(2) Proper climatic conditions; and
(3) Efficient marketing facilities.

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These fundamental factors are thoroly discust before our classes of students who elect fruit-growing among their major studies. They are mentioned here to indicate the fundamental importance of the marketing end of the fruit-grower's business. Efficient marketing facilities include proper transporation and storage, especially the former. There will be no crops unless the plantation is located on proper soil and in a region of favorable climatic conditions. There are many such localities which are suitable for the sites of fruit plantations but which cannot be used to advantage on account of the absence of adequate facilities for getting the crops to market.

The pioneer shipper of fruits under refrigeration, Mr. Parker Earle, is now a resident of Pasadena, California. Mr. Earle, altho now past eighty years of age, is still activ and maintains his interest in fruit-growing. He was the first to use a refrigerator car for the transportation of fruit from California, about the year 1882. Prior to that time the fruit crops were carried in what were then known as "ventilated cars," which were only ordinary freight cars provided with slatted doors at the sides and ends for ventilating. The use of a car which enabled the load to be cooled added much to the certainty of carrying the fruits in sound condition and increast the distance they could be hauled.

DESCRIPTION OF REFRIGERATOR CAR.

A refrigerator car is a portable, cool storage chamber. The walls are insulated with various materials which are poor conductors of heat to protect the contents of the car as far as possible against heat leakage, while in transit. The cooling equipment of the car consists of an ice bunker at each end, of such construction that the air of the car is enabled to enter at the top of the bunker and pass out at the bottom. The ordinary car now in service is supplied with bunkers holding 5000 to 5500 pounds of ice. These bunkers are filled from icing stations placed at different points along the route. Thus a car of fruit moving from California to New York is re-iced from seven to ten times.

The cooling of the carload is dependent upon the circulation of the air in the air thru the ice bunkers and between the pack-

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ages of fruit, the same air being used over and over again. The circulation of the air within the car is due to the difference in temperature of the air columns in the ice bunkers and the car body; the cold air, being denser, flows downward thru the ice, out at the bottom of the bunker and along the floor of the car, absorbing heat from the fruit packages as it passes. The air thus becomes warmer, rises to the upper part of the car, and passes back along the top to the ice bunker, where it is again cooled. In passing thru the ice, the impurities and vapors given off by the fruit are condenst on the ice and are absorbed in the meltage. The air is thereby purified, so that its continued use is not detrimental. The temperature maintained in these cars—depending upon outside temperatures—averages about 40° F. The temperature is not uniform thruout the load. It is coldest near the floor of the car and next to the bottom openings from the bunkers; it is highest at the upper part of the load, thus rendering it impracticable to fill the car completely. Sometimes there is sufficient difference in the temperature of the lower and top parts of the load to cause serious deterioration of the fruit or vegetable carried in the upper part while that in the lower portion may carry in sound condition.

Where the fruits are to be shipt under refrigeration, the packages are stackt in the cars to allow the air to circulate between them. There are limitations in this respect and the loading cannot be done to give the best possible circulation on account of traffic requirements. The carload lots range from ten to thirteen tons, which are the minimum carload weights required by the different transportation lines.

During cool weather and during the winter months, fruits and vegetables are transported without ice. The ordinary refrigerator car is used for this purpose and the contents are cooled by allowing the cold out-door air to pass thru, this being accomplisht by means of special ventilating hoods which can be opened or closed at will. During extremely cold weather, the insulated refrigerator car protects the commodities against freezing to a greater or less degree, depending upon the character of the insulation and the extremity of the weather.

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For long-distance shipment, the fruit must be carefully packt. The various sizes and types of packages in use are designed to enable the contents to be handled in most economic form. With many of the larger fruits, wrapping in a specially prepared soft and absorbent paper is practiced. This protects the fruits from injury and bruising and in addition prevents excessiv evaporation and shriveling or wilting. Wrapping is not a universal practice and from some sections the larger fruits are all packt without wrapping.

In packing for market, the western fruits are graded and sized so that all contained within a package are uniform in variety, size and quality. We find that fruits which must be shipt long distances are invariably more uniformly graded and better packt than those shipt in from nearby markets. This is undoubtedly the fundamental reason for the better packing and shipping methods of our western fruit-growers. They are compelled to handle carefully, and to pack and grade well because the expense and risks of shipment over long distances render unprofitable and uncertain the shipment of low-grade, poorly packt commodities. The producer located nearby does not take the same risk when he ships into the city his crop packt without special care. In any event, he has not the large freight bills to pay or the risk of having his product deteriorate during the time required to get it to market.

The business of producing and handling fruits, especially as it is carried on in the West and South, is a large wholesale business, and the functions of the various agencies engaged in producing and shipping are concerned primarily with getting the products to the wholesale dealers of the primary markets in sound condition and in uniform supply. After the fruit arrives in the primary markets it moves thru the various channels of the wholesale and retail trade to the consumers. These channels are frequently intricate and they differ widely in different markets. The consumer in the city is interested primarily in being able to obtain an adequate supply of good sound fruit at a fair price. I will attempt to discuss some of the fundamental factors governing the successful shipment and storage of fruits and vege-

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tables, and to indicate how the solution of the problems underlying the success of this work may materially affect the consumer.

PRECOOLING.

Under the conditions of shipment in refrigerator cars as indicated above, it will be seen that the ice used in refrigerating the fruit while in transit is required to do two kinds of work: It must cool the warm fruit after it is loaded and it must keep it cool while in transit. The conditions of traffic and expense place limitations upon the design and character of the refrigerator cars in practical use, and the result is that the work of cooling is not done as efficiently as is desirable for the best shipping qualities of the fruit. The temperatures obtainable from melting ice alone are not low enough to do very rapid cooling, and in consequence of this, a very considerable period may elapse before the fruit contents of the car are cooled sufficiently to protect them against deterioration, over-ripeness or decay.

In order to avoid the results of this delay in the reduction of the initial temperature of the fruit, a system of prompt and rapid cooling by special means in advance of shipment has been designed. This system has been designated as "precooling." This relieves the ice of the car from doing the double work, and it is needed only to maintain the load in a cool condition. Much experimental work remains to be done in the application of precooling to different fruit and vegetable handling and shipping, but the process is already in commercial use, especially in California. The principal advantages to be obtained from prompt and rapid cooling—precooling—are:

(1) *A more uniform condition of products in different parts of the carload.* The inequalities of car temperature referred to above are very greatly reduced.

(2) *The successful shipment of fruit of higher quality obtained by allowing the fruit to ripen to a later stage of maturity on the tree before picking.* This is perhaps one of the greatest benefits to be derived from precooling. Where it is not used, many of the quick-ripening fruits, such as peaches, apricots and plums, must be pickt very green in order to allow for excessiv ripening during

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transit. Picking in a green or immature stage prevents the fruit from acquiring full flavor and quality and as a result of this treatment, many of our western fruits have gained a reputation of fine appearance but lack of high quality. When the fruit can be promptly and rapidly cooled, it may be allowed to remain on the tree until it is fully mature and hard ripe. The resulting improvement in quality is obvious.

(3) *Better carrying quality of different fruits and therefore distribution over a much wider territory.*

THE LIFE PROCESSES OF FRUITS.

During the maturing of a normal fruit on the tree, certain chemic and physiologic changes are constantly taking place within the fruit itself. These changes, which result in the acquisition of quality and flavor, constitute the ripening processes. After a certain point is reacht, the fruit becomes over-ripe, quality and flavor are lost and deterioration progresses until eventually the fruit is destroyed by fungous decay or by fermentation or thru destructiv physiologic changes.

A fruit is a living organism which has a definit span of existence, the length of this life depending upon the conditions surrounding the organism. The most important factor which modifies this span of life is temperature. The life activities of the individual fruit continue after it is severed from the parent tree. In fact, the fruit is fit for food only while these life activities are proceeding normally and the fruit is actually alive. After it dies, physiologic deterioration takes place and the fruit is unfit for food.

When the fruit is removed from the parent plant, the life processes constituting ripening are materially hastened, and the life span is greatly shortened if the fruit is allowed to remain warm for any considerable length of time. When the temperature is reduced, the life activities are greatly lessened, thereby lengthening the period during which the fruit may remain in normal condition. The importance of promptly and rapidly reducing the initial temperature of the fruit becomes doubly urgent and in many instances, *e. g.*, where the life span is normally short, it is a necessary condition of shipment over long distances.

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THE INFLUENCE OF TEMPERATURE ON THE LIFE ACTIVITIES OF FRUITS.

The lessening of the life activities of the fruits thru reduction in temperature is the fundamental factor upon which their successful preservation in cold storage depends. The cooling does not completely arrest the life processes; they go on very slowly at the low temperature, thus lengthening the period thru which the fruit organism may perform its functions.

The length of the life span differs with the character of the fruit. It is shortest in the soft fruits such as berries, cherries, peaches, apricots, plums and most pears, and longest for the harder fruits—citrus fruits and apples. This means that the soft fruits are the most activ and have the shortest life span; consequently the length of time these fruits may be held even under the most favorable conditions of temperature is limited. The life activities and consequent life-span vary also with different varieties within the same group of fruits. Some varieties of apples, for example, may be held longer than others; lemons may be held longer than oranges. The importance of quick and prompt cooling—precooling—is therefore greatest in the case of the soft fruits and least for the harder fruits. Experience confirms this principle so far.

CAUSES OF THE DECAY OF FRUITS AND VEGETABLES.

Aside from breaking down and deterioration from over-ripeness, fruits are subject to premature decay due to the attacks of various fungi. Fungi are minute plants, which grow upon or within the tissues of other plants. They do not possess roots, leaves and stems as do higher plants but consist of a mass of stem- or thread-like growth, which produce the fruiting bodies or spores that are analogous to the seeds of higher plants. Like the higher plants, fungi are dependent upon moisture and heat for their growth and the spores cannot germinate or the fungus develop if either of these necessary conditions is lacking.

There are two classes of fungi—parasitic and saprophytic. The true parasites attack and destroy living tissue. The saprophytes subsist upon dead or weak tissues, altho many, after

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they have an opportunity to start, are able to kill the surrounding living cells and thus spread thru and destroy the entire organism. The most common forms of decay fungi attacking fruits are molds of the blue mold type, belonging to the saprophytic class. These forms of mold have not the power to penetrate the sound, unbroken skin of a healthy, normal fruit. Most of the decay occurring in the fruits while in transit and storage starts at injuries and breaks in the skin, caused almost entirely by rough handling in preparing the fruit for market, either in picking, grading, hauling or packing. Wounds, bruises, scratches or abrasions of any kind allow the organism to gain entrance and once within the tissues the killing of surrounding cells takes place, and the entire fruit is soon destroyed. Other fungi which are not dependent upon injuries to start, attack fruits in transit and storage; but these forms of decay are much less prevalent.

The germination of the decay spores is dependent upon proper moisture and temperature conditions, just as is the case with the analogous seeds of higher plants. Germination of the spores does not take place while the fruit is perfectly dry or when the temperature is low. After the spores have germinated, however, and the decay has started within the fruit, even as low a temperature as 32° F. will not wholly check it. Growth of the mold is only retarded and the decay continues slowly until eventually the entire fruit may be destroyed.

From what has been said above regarding the character of the decay occurring in fruits while in transit and storage, it will be seen that the most important factors underlying their carrying and delivery in sound condition is an unbroken healthy skin. I am sure my physician hearers will readily appreciate the importance of this point. All operations of picking, grading, packing and shipping must be carried on with care to prevent injuries of various kinds. In general, it has been found through the investigations of the United States Department of Agriculture that the chances for injury are directly proportional to the number of steps thru which the fruit must pass in preparing it for market. Fruits which must be washt, brusht, or otherwise past thru cleaning processes to make them presentable to buyers

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are most likely to be injured and, where such treatment is necessary, the work must be done with the greatest care to avoid breaking or otherwise injuring the skin. Some fruits are naturally more susceptible to injury—are more easily injured—than others. The influence of handling methods upon carrying and keeping quality is paramount. In a general way growers have realized that it was necessary to handle fruit carefully, but they had no conception of the extent of injuries being done until the Department investigators made careful counts and actual determinations. It was not uncommon to find from 40 per cent. to 75 per cent. of the oranges or lemons injured in some way in the market preparatory stages thru which the fruit was past. Likewise, from 10 per cent. to 15 per cent. of the apples were injured in picking and packing, and frequently table grapes were found with 5 per cent. to 40 per cent. crackt or crusht in handling. When it is remembered that each injury is a possible source of infection, the importance of conducting the handling operations in such a way as to avoid these injuries becomes duly impressiv.

During the course of the Department investigations, it was not uncommon to find 5 per cent. to 25 per cent. of the oranges, 10 per cent. to 40 per cent. of the lemons, or 8 per cent. to 20 per cent. of the table grapes actually decaying while in transit, all these losses being directly traceable to injuries of various kinds made in preparing the fruits for shipment. Changes in the handling and management of the citrus industries of California and Florida have resulted in a very great reduction of the decay losses. In some instances, and during certain seasons following the demonstrations of the Department workers, decay was practically eliminated.

HOW HEAVY DECAY AFFECTS THE CONSUMER.

The occurrence of high decay affects every agency connected with the handling of the fruit: producer, shipper, wholesale and retail dealer, and the purchasing consumer. It is perhaps easy to see how it affects the producer, because upon him falls the direct money loss of the fruit decayed, as well as the loss due to the poor reputation which his product attains. It affects the dealers to

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some extent, as they must in some way recoup themselves by charging a higher price for the good fruit which remains. Here is where it affects the consumer. He has to pay a higher price for an inferior article. He cannot afford to purchase as much as he should like or he becomes dissatisfied with his purchase and either does not buy again or limits himself to small quantities. In either case consumption is appreciably decreast. This depression is reflected along the line back to the producer, and so the vicious circle is completed.

The occurrence of heavy decay may appreciably affect the supply of fruits in the markets. One or two samples will suffice to indicate how great this really is. An average of 5 per cent. decay in all shipments of oranges from California means a loss based on an annual production of 40,000 carloads in the State of 2,000 cars or about 800,000 boxes of fruit. The average loss of fruit in table grape shipments due to decay, based on the annual production in the State of 8,000 carloads, is nearly 500 carloads or in the neighborhood of half a million 25-pound crates. Such examples could be cited for practically all fruits. A very serious reduction of available supplies is the result and the consumer is deprived to that extent of a wholesome food product.

Not only is the available quantity affected, but as has been indicated, the price is also affected. The uncertainty of whether the fruit on his hands will remain sound long enuf to be sold compels the dealer to increase the price to the consumer. He cannot afford to run any risk. The increase in price may mean that many of the common people cannot afford to buy and to them fruit becomes a luxury. The elimination of decay and the possibility of delivering the fruit in sound condition thruout the season stabilizes the industry. The result of the elimination of decay in oranges, for example, has had the effect of increasing the returns to the producer, thereby encouraging greater production of good fruit, and the prices which the consumer has had to pay have not been correspondingly increast; in fact they have frequently been reduced; paradoxical as this may seem. Thus the supplies are kept up to the maximum and the prices are stabil-

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ized, bringing the fruit within the reach of the greatest number of consumers.

IMPORTANCE OF THE SYSTEMATIC DISTRIBUTION OF FRUIT CROPS.

Efficient transportation service coupled with handling with sufficient care to enable shipment in sound condition has rendered possible a systematic distribution of the crops among the markets of the country. Unsystematic or haphazard sale in a few markets frequently results in serious gluts and consequent disaster to the producers. At first sight this may seem to be an advantage to the consumer as he is able for a short time to obtain his supplies at a very low cost. However, such a condition of uncertainty is not beneficial to the consumer in the long run. The sacrifice of a crop necessarily results in a curtailment of shipments and the season of glut is usually followed by comparativ scarcity. The instability and uncertainty result in preventing the masses from obtaining regular and constant supplies. The consumer suffers from this in the irregularity of his diet. During the times that serious gluts prevail in the larger markets, there are frequently many smaller towns and cities which are not supplied. The fruit which is wasted in the city may be needed to feed the people of the surrounding territory. A regular and systematic distribution results in only a quantity being shipt to a given market sufficient for its ample needs and the sending of additional supplies to unsupplied territory. In this way a much wider sale and a more stable condition is brought about. Such systematized distribution is only possible thru organized effort and this is perhaps one of the most beneficial results of co-operativ efforts on the part of producers in the marketing of their crops. Along with systematized selling thru organized agencies, standardization in picking, grading and packing are accomplisht, with the result that there is a much more certain and stable supply brought within reach of the great masses of consumers. When we consider the important place fruits should have in the diet of the masses, we can well appreciate the benefits of this organized movement among the producers and shippers of fruits and other crops to insure steady supplies at fair prices.

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THE STORAGE OF FRUITS.

There are several methods of conserving fruits and vegetables: by drying, canning, "preserving," and cold storage. The last named is the only means of holding them in an unchanged condition and while dried, canned or preserved fruits and vegetables serve excellently as foods, they cannot entirely take the place of the fresh products. Cold or cool storage is the only means of accomplishing the important object of preserving these foods in their original or fresh condition.

There has been much discussion in recent years regarding the holding of food materials in cold storage. Part of this discussion has had reference to the wholesomeness of cold stored foods, but much of the agitation has dealt with the attempted investigation of the increast cost of living. It has been widely asserted that cold storage is very largely responsible for the increast cost of living due to the supposition that advantage is taken by a comparatively few corporations or individuals to buy up and to some extent "to corner" certain food necessities, hold them in cold storage, and thereby control the prices and the marketing of these products.

The assertion that cold storage fruits or vegetables, or any food commodities, are unwholesome as such is erroneous. Cold storage alone has never resulted in unwholesomeness, unless indeed the product was held beyond the limit of its possible usefulness. As far as fruits and vegetables are concerned, there is no possibility that any deleterious effect can follow the use of the cold-stored products. There are no hidden germs or ptomaines likely to affect the health of the consumers. Evidences of deterioration beyond the point of usefulness or safety of consumption are always plainly visible in these commodities. No one, therefore, is likely to eat a decayed or a physiologically dead fruit.

The assertion that attempts have been made to corner food supplies thru the medium of cold storage may be true in some instances. There has been so much said regarding the unfavorable side of the matter that many may have lost sight of any other point of view.

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Legal regulation of the cold storage of food products is the remedy sought, and several states have past laws to control this business. In some instances, it is proposed to limit arbitrarily the length of time foods may be held in storage without consideration of their condition at the end of the time limit set. Bills have been introduced before Congress having federal control in view. Legal regulation is undoubtedly wise and the cold storage interests are in favor of the enactment of fair regulatory laws. The stand that cold storage as such is something to be avoided if possible is wholly wrong and results in casting discredit upon, and bringing into disrepute, a very valuable adjunct to our means of food conservation. Arbitrary legal regulation is liable to work hardships on both producers and consumers, and such laws may even defeat the objects which the regulation is intended to accomplish. We need not champion the cause of the cold storage warehousemen. They are well able to take care of their own interests. We should be interested, however, in knowing the truth about the matter, and a few of the factors involved should be of some interest here.

The adoption of an arbitrary length of time beyond which all food products may not be held is unreasonable; it may even result in serious mistakes and add to the uncertainty rather than to correct the evils which might otherwise prevail. The length of time which foodstuffs can be held in sound and wholesome condition is different for different classes of products. Different standards are necessary for eggs, poultry, meats of various kinds, fruits and vegetables. But even this may lead to confusion and trouble if the period is adopted without some consideration of the condition of the products at the time they are placed in storage. This manifestly increases the complexity of the problem.

Many of the laws proposed and adopted provide for the marking of cold-stored goods and the inspection of the foods in storage from time to time. The marking is required on the assumption that the cold-stored product as such is necessarily inferior. Few, if any, of the laws emphasize the importance of inspection before the commodities are offered for storage. If a rigid inspec-

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tion and a certificate as to the soundness of the product and its fitness for storage purposes were required, much loss would be avoided and the adoption of the legal period of storage could be more equitably adjusted. It is impossible to improve the condition of a product by storage. If it is poor when it goes into storage, it will be in much poorer condition when it is withdrawn. If it is in good condition when it enters the cold storage plant, the chances of holding it in sound condition are excellent, provided the storage plant is properly operated.

Some of the advantages of refrigeration have already been discust. By it, in the refrigerator car (the trip to market in a refrigerator car may be considered as a short period in cold or cool storage) fruits and vegetables may be distributed over a very wide territory and the marketing thereby greatly extended. Thru the medium of cold storage the season may be greatly extended. With some of our fruits, the quantities produced have reacht volumes larger than can be consumed during the normal season of production. The apple industry of the United States has already reacht that stage. If all the apples produced had to go into immediate consumption on account of there being no means of holding them for a longer period of distribution, it can be seen that the markets would be overstockt with apples during the normal season, and prices would be far below the cost of production. We should have tremendous quantities for a comparatively short time and then a great scarcity. During the time of plenty, the fruit would be cheap while during the time of scarcity it would hardly be obtainable at any price.

By means of cold storage, we are able to regulate this condition and instead of having alternate seasons of plenty and scarcity, we now have a steady supply of this wholesome fruit at prices which are fairly reasonable to both producer and consumer. In fact, apples are now obtainable the year round. The lengthening of the marketing season places the fruit within reach of all. Storage facilities have made the apple one of the staple foods.

Cold storage enables the lengthening of the marketing season of other fruits, altho not to the same extent as with the apple. Certain varieties of pears may also be held for several months

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and a few varieties of table grapes may be held for the holiday and midwinter season. Oranges may be held for several months. Celery may be held for several months; potatoes and cabbage are also stored successfully. The softer fruits are not suitable for long holding in storage. All classes of berries and cherries may be frozen and held for several months in a suitable condition for use in ice-cream, sauces, pie making and other forms of pastry where solidity is not required.

The factors which influence good storage quality are: soundness in handling, prompt storage, and a proper storage temperature. The first two are the functions of the producer; the last is the function of the cold storage warehouseman. He must maintain the storage rooms at the proper temperature and in proper sanitary condition. With a few exceptions, the standard storage temperature for fruit and for celery and cabbage is 32° F. Fluctuation in the temperature of the storage rooms may result in serious deterioration. But, as has already been mentioned, all forms of deterioration in fruits held in storage are plainly visible and there is no likelihood that any unwholesomeness due to storage will occur.

CONCLUSION.

In closing, I desire to express my appreciation of the opportunity to present a few of the important factors relating to the transportation and storage of fruits. To the producers of fruits, especially on the Pacific Coast, the problems of finding markets for a very large increase in production are becoming very urgent. It will be necessary to induce people to use more fruit if all the crops in sight are to be sold to advantage. While at first sight this may seem like a selfish attitude to take in order to justify what has been said, I feel that I can make this assertion with a clear conscience, especially to a body such as this, whose members undoubtedly appreciate the wholesomeness and benefits of an increast use of fruits of all kinds in our diet. We can definitely promise greatly increast supplies, which in the very nature of things, will be available to the great masses of consumers in the cities at prices which will enable them to use fruits as regular foods and not as luxuries or condiments.

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THE CONTROL OF THE PREPARATION AND PRESERVATION OF MEAT FOODS.

By M. Dorset, M.D., Chief of the Biochemic Division, Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C.

No argument is required to show the necessity for the control of the preparation and preservation of foodstuffs. The health of the people depends in large measure upon the wholesomeness of their foods. This wholesomeness which is so much to be desired can be secured only thru official control and supervision of food preparation, because in the case of meat foods, the fact that the food is rendered unfit by disease can frequently only be discovered thru examination of the animal at the time of slaughter, when all of the organs of the body are intact, and furthermore, contamination of food products during the course of preparation, with bacteria of various kinds, is not discoverable by the consumer. It is likewise true, that the addition of preservatives which may be harmful to food substances, can be discovered only by an inspection of the food during the course of its preparation or by a chemical analysis. The inability of the producer to protect himself has created a demand on the part of the people for proper food control, and has served to arouse a general interest in the subject, and to cause special studies to be made of the various food-producing industries. This has resulted in specialization, and thus each separate branch of the industry presents problems peculiar to itself. Discussion of details must be left to specialists in each line of work.

It has been my fortune to be associated in a small way with the enforcement of the Federal meat inspection law. Therefore, while it seems undesirable in this paper to consider the details, I wish to speak of those things which are of fundamental importance in the control of the preparation and preservation of meat foods. The people of the United States consume annually about 15,000,000,000 pounds of meat and meat food products, including lard. Of this amount probably 60 per cent., or 9,000,000,000 pounds, is produced at slaughter and packing houses under Federal supervision, while the remaining 6,000,000,000

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pounds are subject to such inspection as may be required by the states and municipalities.

The meat inspection of the Federal Government, which is carried out by the United States Bureau of Animal Industry, has been spoken of, and I believe accurately, as the most thoro and exacting national inspection which is known among the countries of the world. I believe we may be sure, in so far as it is possible to be sure of things that depend upon the judgment of men for their correctness, that meats inspected and past by the United States Bureau of Animal Industry are thoroly fit for human food. The success of the Federal meat inspection has been brought about thru a strong and comprehensiv law, with adequate appropriations, and a strict merit system applied to the personnel.

In the case of meats which do not come under the jurisdiction of the Federal Government, the case is different. Each state and each municipality has a system of its own. The laws are frequently insufficient and the appropriations inadequate, so that the local inspection is too frequently either entirely lacking or else ineffectiv. It is highly important to the people of the country to secure a more effectiv inspection and control of the 6,000,000,000 pounds of meats which are produced in the country for local consumption.

Efficient control of the preparation and preservation of meat foods must rest upon three fundamentals as a basis. These are:

1. Broad and comprehensiv laws.
2. Adequate appropriations for enforcement of the laws.
3. Wise administration of the laws.

These three fundamental requirements are interdependent. The laws must come first, but they can be of no avail without money to enforce them, and both laws and money will prove unavailing unless administered by wise and fearless public officers.

1. *Legislation.*—Laws intended to control the preparation and preservation of meat foods could well be modeled after the Federal meat inspection law, which has been tried and found effectiv. They should require inspection of all food-producing animals both before and after slaughter, and the inspection should, besides, include all processes to which meats are subjected at slaugh-

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tering and packing establishments, and all compartments, rooms, and other places where meats are stored or handled. Power should be conferred upon the proper officials to condemn and destroy for food purposes, all carcasses, parts of carcasses and products which are found to be unfit for human food; to control the use of preservatives or other substances which might prove injurious to the consumer; to exclude from food-producing establishments persons affected with contagious or communicable diseases, and to regulate the handling and storage of foods up to the time of delivery to the consumer. All meats and meat-food products after being inspected and found fit for human food should be markt in such a way as to permit of their ready identification. Meat inspection laws should prohibit the sale of uninspected meats, and power should be given to the proper officials to withdraw inspection from establishments which violate any provisions of the law or of the regulations based thereon. Heavy penalties should be imposed upon violators of the law and upon all who attempt, by bribery or other improper means, to influence inspectors or others charged with the enforcement of the law.

2. *Appropriations.*—Powers such as those indicated above would be of no effect without appropriations for the employment of an adequate force of trained men. Unfortunately, it too often happens, particularly in the case of municipal meat inspection, that the funds provided are entirely insufficient, and that they are used to provide small jobs for political hangers-on, thus rendering proper inspection impossible. Proper meat inspection requires the services of trained men who devote their lives to this work. Such a force of men can be secured only by providing adequate salaries, and by adopting a strict merit system entirely removed from political or other outside influences.

3. *Administration.*—As I have already stated, and as every one will undoubtedly agree, adequate legislation and abundant appropriations will not in themselves be sufficient to insure proper meat inspection. A wise and firm administration is the third essential to success. At first thought it might seem to be a simple matter to enforce a meat inspection law, and I doubt whether anyone who has not been associated with such work

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can conceive of the endless problems and the manifold difficulties that must be encountered under the most favorable circumstances. Officers charged with enforcing meat inspection laws have a double responsibility placed upon them: (1) The *prevention of the sale of unfit food*, and (2), of almost equal importance, *the conservation of wholesome food*. All unfit articles of food should be destroyed, but at the same time the greatest care must be taken to see that wholesome food is not needlessly condemned. In meat inspection, as in other similar lines of work, the inspector is confronted with some conditions which clearly require condemnation, but since processes of decomposition and diseases of animals are progressiv, there is constantly presented the problem of deciding when a product has actually become unfit for food. Such questions require the best thought of the best men. The easiest way out of such difficulties might be for the inspector to destroy all food concerning which any question arises. But while such a plan might simplify the problems of the officer, it would be both unreasonable and unjustifiable. There is probably no subject which has been of more concern to the people at large in recent years than the cost of food. To needlessly destroy wholesome food would necessarily increase the cost of food to the consumer.

It seems that any meat inspection service should be so organized and conducted that it will serve not merely to destroy unfit food and to punish violators of the law, but that it will be constructiv as well. Packers and others who handle foods should be taught the best methods, which are not necessarily the most expensiv methods, of preventing the decomposition and spoiling of meats and meat products. The great majority of producers will welcome suggestions of this character, which will result, first of all, in the conserving of much food which is now lost thru improper methods of handling; secondly, in the improvement in the quality of foods now produced, and last of all, in the saving of money to the producers themselves.

The subject of the preservation of foods has been given such wide attention thruout this country during the last few years that it has come to be considered frequently as a problem separate

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and distinct from food control along other lines. By some the question of food preservatives is placed first in importance among all questions relating to food inspection. In so far as meats are concerned, it is my opinion that this question, while undoubtedly of importance, is quite secondary to the more vital questions relating to the source and methods of handling foods at slaughtering and packing establishments. The ideal method for food preservation is undoubtedly cold storage, but it is not possible in all cases to apply this process. For example, hams and bacon when subjected to salting and smoking may be preserved in a wholesome condition for a longer time and more cheaply than would be possible if cold storage alone had to be depended upon. From time immemorial foods have been preserved by the use of certain chemicals, such as salt, sugar, saltpeter, vinegar, etc. It seems that it is necessary to use these substances in order to carry food over from the time of plenty to the days when it is scarce, and prolonged use has likewise seemed to show the harmlessness of these common preservatives. In considering the use of chemicals, which are new and untried, for the preservation of foods, we should always bear in mind that the processes of the human body are extremely intricate, and that our methods of studying these processes are as crude as the processes are intricate and obscure.

Administrativ officers should, therefore, approach with caution proposed innovations in the shape of chemical food preservatives, and should require the demonstration that when used in food such substances are harmless, and that their addition will benefit the public either thru the cheapening of the food or thru a more efficient preservation of it. It is clear that the question of the use of food preservatives is one which must be decided by a wise executiv. For however much information we may secure by scientific research, there are always left open questions which the scientist cannot answer with definiteness.

NOTE: The following named papers are recommended to those interested in the details of the Federal meat inspection and in problems relating to local meat inspection:

"The Federal Meat Inspection Service," by A. D. Melvin, D.V.S., Bureau of Animal Industry—Circular 125.

"State and Municipal Meat Inspection and Municipal Slaughterhouses," by A. D. Melvin, D.V.S., Bureau of Animal Industry—Circular 185.

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THE ECONOMIC IMPORTANCE OF FEDERAL INSPECTION OF MEAT AND MEAT-PRODUCTS DESTINED FOR COMMERCE.

By W. H. LIPMAN, M.D., Chicago.

The second half of the last century and the beginning of the present one have to their credit greater achievements in the field of medicine from the standpoint of resulting benefit to humanity, than any other period in the history of medicine.

The one outstanding feature that lends monumental pre-eminence to the accomplishments of the 19th century in the domain of the healing art, is the fact that most of the discoveries of that period were either of a direct prophylactic nature or were of a character that led to the development of prophylactic measures.

The medicine of the 19th century may well be called the medicine of prevention. The creed of prevention was conceived and was born in the 19th century and was adopted by the 20th century, which promises to develop it to such gigantic proportions as to transform the physician into a sanitarian and materia medica into a health guide-book.

Meat inspection, developt largely in the last half of the 19th century, is merely one form of prevention of disease. It belongs to the science of sanitation and its function is the production and selection of sound and healthful meat-food and to maintain it as such until it reaches the table.

Modern medicine has absolved food, especially meat-food, from the time-worn charge placed upon it in the dark days of medical guess work, that it can of itself produce disease.

Once having acquitted food of the charge of being an enemy of man, man began to make friends with it, and physiologists and preventologists, as well as clinicians, began to sing its praises, and we were told that good food and plenty of it is man's best protection against the development of disease, that the well nourisht body is impregnable to the onslaughts of disease germs.

But, said the champions of food as a prevention of disease,

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before we are ready to take our food we must be certain that it is sound and has not become contaminated either at its source or in the process of preparation. Therefore, all food, but especially meat-food, because of its importance in the dietary of civilized man, must be scientifically examined. Thus, meat inspection became a sanitary necessity.

Being animal tissue, it follows that meat can be affected with the diseases common to the species from which it is derived, and altho very few of the diseases of food animals can be contracted by man thru eating of their meat, the importance of rejecting and excluding all meats affected to an extent that they are capable of conveying disease, is apparent.

The old world was quick to see the hygienic importance of meat inspection, and it was there that it was first elaborated and establisht in accordance with modern scientific principles. Our own country soon followed suit, and while in the beginning our inspection was limited, it was gradually broadened so that now it is equal, from the standpoint of scientific accuracy and thoroness, to that of any European country and superior to many of them.

At present, Federal meat inspection in this country is operating under the law past by Congress in 1906, empowering the Secretary of Agriculture to make ante-mortem inspection of all cattle, calves, swine, sheep and goats, and post-mortem examination of the carcasses and parts thereof, which are to enter interstate and foreign commerce. In addition, the law provides for the strict supervision of all processes of preparation of meat-food products, such as canning, curing, etc., and prohibits the use of all injurious preservatives. It further sets forth certain definite sanitary requirements for the entire physical equipment used in the slaughtering of food animals and the preparation of meat-foods. The law also controls the labeling and branding of meat-foods, so that every container must bear a label showing in clear definit language just what it contains, and every carcass and part must be branded or stampt to show that it has been inspected and past by the Department of Agriculture and the number of the establishment at which it was prepared.

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The law extends still further and gives the Secretary of Agriculture the power of control over all meats while in interstate and foreign shipment, so that he may reject them whenever they are found unsound.

According to the law when a carcass or part, or any meat-food product, upon inspection at the time of slaughter or in the process of preparation, or in shipment, is found unfit for human food, it must be effectively destroyed by chemical and physical processes so that the products of destruction could in no way be used for human food.

Ante-mortem and post-mortem inspections are based on regulations issued by the Secretary of Agriculture under the law of 1906, which set forth the disposition of carcasses and parts, and accordingly, a carcass or part may be either:

(1) Past for food outright.
(2) Past for food after sterilization only.
(3) Condemned for destruction.

These regulations are in conformity with modern principles of pathology and etiology and embrace all possible conditions. Only those carcasses and parts thereof that in the light of modern science can be assumed to be free from all disease, contamination and products of decomposition, are past for food. In the process of inspection the entire carcass and all organs and glands are carefully examined, and all signs of abnormal conditions are lookt for and detected.

An idea of the thoroness of Federal inspection can be gained from the fact that during the nine-year period from 1906 to 1914, inclusiv, one and one-third million whole carcasses and five and one-half million parts of food animals were condemned, and in addition one hundred and seventy-nine million pounds of prepared meats were condemned on re-inspection.

A serious contemplation of these formidable figures must at once force three important conclusions:

First. That a system of inspection that causes the rejection of such an enormous quantity of food on sanitary grounds is unquestionably a tremendous factor in promoting public health;

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Second. That the loss produced by such rejection is a serious economic problem;

Third. That energetic educational measures should be instituted among the producers in the country to eradicate the causes of rejections at their source.

No country is so rich that it can afford the wasting of a large part of its meat supply, and because of the constant shrinking of the number of food animals in this country in proportion to the growing population, it is evident that the problem of how to diminish the loss occasioned by Federal meat inspection is worthy of our best thought.

The loss may perhaps be better appreciated when it is reduced to dollars and cents.

For the fiscal year 1914, according to the annual report of the Chief of the Bureau of Animal Industry, 500,000 animals, including cattle, swine, calves, sheep and goats, were rejected by Federal inspectors, and in addition 19,000,000 pounds of prepared meats were condemned on reinspection. The loss produced by these rejections computed on the basis carefully workt out by the large packing houses, amounts to $8,000,000. The total weight of the rejections, figured on the basis of the average weight of drest animals plus the 19,000,000 pounds of prepared meats, reaches the enormous quantity of 132,000,000 pounds.

Assuming that the average per capita consumption of meat per annum in the United States is 165 pounds, enuf meat-food was rejected to supply 800,000 people for a year. To put it more tersely, the meats rejected would have kept the cities of San Francisco and Los Angeles in meat for a whole year.

It can be seen that such a loss is an economic menace. Somebody, somehow, pays for this loss. It would seem logical and just that the loss produced by condemnation of animals because of disease, should be borne by the owners in whose custody the animals acquired the disease, but such is not the case.

The owner who sells his live stock for slaughter in the great packing centers thruout the country is not made to pay back for the loss of that part of his stock that was condemned by Federal inspection, regardless of how big that loss may be. It does

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not seem like sound economics nor good business; nevertheless, that is the practice to-day.

Such a condition of affairs is not calculated to stimulate a desire in the breeder of stock to go to the trouble of taking steps to prevent the development of those conditions among his animals that cause their condemnation. Indeed, not many stock raisers know whether or not their stock was condemned after slaughter.

When the packer buys a number of animals for slaughter and several of them are condemned and are a loss to him, it follows that the remainder costs him what he originally paid for the entire lot, and as a natural consequence the meat of the animals that have been past costs more pound for pound.

It must be remembered that the Federal meat inspection law applies only to those meats that are intended for interstate and foreign commerce—it has no jurisdiction over meats of animals killed by butchers, farmers and others for local consumption, and because at present only 60 per cent. of the meat consumed in this country is under Federal inspection, the loss resulting from condemnations actually falls on only 60 per cent. of the people.

It is evident that the benefits derived from Federal inspection in that it acts as a safeguard to the health of the consumer by far exceed the loss produced thru condemnations, but it is equally as plain that if some means were available that would diminish or prevent the loss, without affecting the sanitary value of the inspection, a very material public gain would be accomplisht.

Since condemnations are always based on definit causes found in the animals inspected, it can be seen that the surest way to stop the condemnations is to prevent the development of those causes among animals. It is not to be expected that all the causes can be eradicated, even after the most painstaking preventiv work, but it is unquestionably true that some of them can be materially reduced and in time abolisht entirely.

A study of condemnations as reported annually by the Chief of the Bureau of Animal Industry, soon reveals the fact that

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while the causes of condemnations are many and include practically every conceivable condition that may be found in animals, the majority of the condemnations are produced regularly year by year by two causes, namely: tuberculosis and hog cholera.

For the fiscal year 1914 tuberculosis caused the condemnation of 30,000 cattle, while 28 other causes combined were responsible for the loss of only 18,000. In other words, tuberculosis causes one and two-thirds times as great a loss of cattle as all other causes put together. In the same year tuberculosis was responsible for the loss of 48,000 and cholera caused the condemnation of 116,000 hogs, while 32 other causes totaled the condemnation of 40,000. In other worlds, for the fiscal year 1914, tuberculosis produced the loss of 78,000 animals and hog cholera the loss of 116,000. These are very significant facts, because they point the way for attacking the problem.

These losses represent animals killed under Federal inspection only, that is, about 60 per cent. of the total animals slaughtered in this country. It is reasonable to assume that the animals killed without Federal inspection are affected at least to the same degree as those that are inspected by the Federal Government.

The condemnation of animals by Federal inspection on account of tuberculosis and cholera, represents only a small part of the loss produced by these diseases to the live stock of this country.

It has been estimated by authorities that 10 per cent. of the dairy cattle and one per cent. of the beef cattle of this country are tuberculous. The damage produced in these animals that remain on the farm by far exceeds the loss sustained by inspection. This damage operates in the following ways:

By diminishing milk production, which Dr. A. D. Melvin estimates at 10 per cent.;

By decreast fertility;

By failure to thrive and loss of weight;

By increast mortality;

By spreading the disease.

It has been definitely establisht that allowing hogs to feed on the excreta of cattle is the most fertile cause of the spread of

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tuberculosis among swine. Tuberculosis in hogs can thus be attributed to cattle.

In the report of the Bureau of Animal Industry for 1908, Dr. A. D. Melvin estimates the total loss to the farm animals of this country from tuberculosis at $23,000,000 per year. The disease, however, has been constantly on the increase since then and the loss has, of course, increast proportionately. The loss is made still greater by the fact that the value of live stock has increast, as, for example, the rise of the average value of milch cows from $35.00 in 1910 to $55.00 in 1915.

It is logical to assume that the present loss from tuberculosis in farm animals in this country is approximately $40,000,000 per year.

The Secretary of Agriculture estimates that cholera caused a loss in 1913 of 6,000,000 hogs, valued at more than $60,000,000.

Therefore, tuberculosis and cholera combined cause the loss of $100,000,000 in live stock in this country per year.

Fortunately, hog cholera is not communicable to man,—it is purely a disease of swine, and the danger of man acquiring tuberculosis thru meat, especially inspected meat, is so remote that authorities look upon it as negligible. The real and sole danger to the health of the people from bovine tuberculosis lies in the use of milk from tuberculous cows.

The indications then for combating these two animal diseases are based on sanitary and economic grounds. In the case of tuberculosis, both sanitary and economic, in cholera purely economic.

Recognizing the urgent necessity of stamping out hog cholera, the Federal Government appropriated $75,000 in 1913 for that purpose and in 1914 increast the appropriation to $500,000.

This work is naturally in the hands of the Department of Agriculture. We are all familiar with the work of the Department in the elaboration of the serum treatment of the disease, both prophylactic and curativ.

With the facilities at its disposal that this appropriation affords, the Department of Agriculture can be confidently expected to check the ravages of hog cholera. Already stations have been establisht in several of the heavily infested states, and a vigorous campaign is conducted with the activ co-opera-

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tion of the state authorities. The work includes educational and sanitary measures and the use of serum.

The results so far reported have been decidedly encouraging. The mortality of the herds treated with serum was markedly lower compared with herds not so treated, and the prophylactic use of serum reduced the mortality in those animals who later developt the disease to negligible proportions.

A recent inquiry of the Rockefeller Institute for Medical Research by the writer brought the reply that the Institute is seriously considering the study in the newly organized Department of Animal Diseases of some one fase of the cholera question. The high standard of the work already accomplisht by the workers of the Institute in other fields, warrants the hope of important accomplishments from them. The very fact that the Institute considers the subject of sufficient moment to merit its attention, forcibly illustrates its importance.

There are certain features about hog cholera that exert a helpful influence on preventiv work.

In the majority of instances it is an acute, rapidly spreading affection, with a high mortality, the animals dying quickly on the farm, so that the owner's losses are high. Seeing that his herd is threatened with extermination, the owner is in a more or less receptiv mood for a campaign of prevention; he is ready to listen to reason and is open to conviction.

Anti-tuberculosis work, on the other hand, is beset with difficulties at the very inception. The insidiousness in onset and the chronicity of its course, make the cattle raiser anything but helpful in activ anti-tuberculosis work.

Nevertheless, powerful and numerous agencies have been and are actively engaged in the march against animal tuberculosis.

The Federal Department of Agriculture, state veterinary authorities, live stock sanitary boards, agricultural colleges, farmers' and breeders' organizations, and many other more or less thoroly organized bodies are waging a strong campaign.

In spite of all, however, tuberculosis of cattle and hogs is steadily increasing, according to the report of the Secretary of Agriculture for 1914. Among the 57,000,000 animals slaughtered under Federal inspection in that year, no less than 533,000 were

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found infected with tuberculosis. The fact that the disease is increasing does not necessarily mean that the preventiv measures already inaugurated are not accomplishing results; it means that more energetic and more comprehensiv measures are necessary.

It means that some reasons exist that make the present campaign against animal tuberculosis ineffectual.

The work undertaken against tuberculosis has usually been conducted in the following ways:

(1) Education of the cattle raiser in the economic and sanitary importance of the disease, in modes of its dissemination, preventiv work and the advantage of prevention.

(2) Discovery of the disease on farms by means of the tuberculin test and the disposition of infected animals either by slaughter or segregation.

(3) The raising of healthy herds.

(4) Sanitary measures designed to clean up infected premises on the farm and to prevent infection of cattle while in transportation at exhibits, fairs and like places.

To carry these measures thru, a great deal of legislation, Federal and state, is necessary. Laws are needed that will make their application possible.

Most states at present have laws requiring certificates of health to accompany all cattle entering the states for dairy and breeding purposes and in the absence of such certificates the cattle must be found free from tuberculosis by the tuberculin test before admission. While these laws are essentially alike, they differ radically in some details, and therefore cause a great deal of confusion and uncertainty.

The ultimate solution of this fase of the question seems to rest in the passing of a Federal law requiring the testing of all cattle with tuberculin that cross the state boundaries for purposes other than immediate slaughter.

Some way must be found that will make it possible to trace all cattle and hogs to their source of origin, so that when some of them are found infected at the time of slaughter, their owners can be notified and necessary precautionary measures installed. In many instances, Federal inspection at the time of slaughter enables the Government to trace infected localities in various

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parts of the country, but in the absence of a comprehensiv system of identification, the advantage gained by means of inspection cannot be followed up.

If the animals slaughtered at present by butchers and small dealers for local consumption without inspection, would receive either Federal, state or municipal inspection, another effectiv means of finding out infected districts would be available, because these animals usually come from near-by places, so that it would be an easy matter to trace their origin.

For that reason, and for the reason of the necessity of the protection of the consumer of these at present uninspected meats, the passing of laws putting them under some sort of inspection must be urged.

The benefits derived from the laws existing in various cities making it obligatory on the part of physicians to report to the health authorities all cases of tuberculosis in human beings are well known. These laws have proven to be most efficient steps in inaugurating prevention. The same results could be accomplisht if laws were past compelling veterinarians and others having knowledge of the existence of tuberculosis in domestic animals to report to state veterinary authorities.

In order to bring the entire question of animal tuberculosis under the control of the Federal and state governments, additional laws will undoubtedly have to be enacted, as for example, some form of indemnification of the owners for the loss of animals destroyed in the course of preventiv work. It is not to be expected that all necessary legislation can be forthcoming within a short time. The urgency of the problem, however, and the fact that the existing laws are inadequate, as shown by the constant increase of tuberculosis, make it plain that a beginning must soon be made.

It is a common experience that the best and surest way to secure needed legislation, is to create an insistent public demand for it. Once the law makers are convinced that the public demands a given measure, its passage will soon be forthcoming.

Because animal tuberculosis so closely touches the question of human tuberculosis, the education of the public in the entire problem and the creation thereby of a demand for the needed

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measures of relief would properly seem to be not only the function, but the obligation, of the medical profession.

Primarily, animal tuberculosis is, of course, a health question, and, secondarily, it is a problem in food economics. In its ultimate analysis, the food question, even economically considered, is in reality a health question, because as food is made more available health becomes more possible and as food is wasted health is dissipated.

The physician of to-day and to-morrow cannot remain merely a healer,—he must become a teacher and preacher of health preservation.

The task of preserving the nation's health by preventing the needless wasting of a great part of its food is part of the business of the physician.

To stop the loss of the people's meat is an undertaking worthy of the best efforts of 20th century medicine.

Sociologic medicine must help and encourage the forces charged with the eradication of animal diseases that are responsible for the condemnation of meats. These forces know the ways and means necessary to stop bovine tuberculosis and hog cholera,—we must make these means available.

We must convince the nation of the need and possibility of wiping out these scourges and the nation will soon demand that it is done.

Our best efforts must be utilized to bring to the knowledge of everyone that Federal meat inspection safeguards the health of the people.

We must insist on the need of establishing inspection, state, municipal or Federal, of those animals at present slaughtered and sold without inspection.

We must make plain that milk is a serious source of transmitting bovine tuberculosis to man, so that municipal and state authorities will demand milk from cows free from tuberculosis.

The breeder must be made to see that it is wrong for him to permit his cattle to acquire diseases that will cause their condemnation and a consequent economic loss.

When we have accomplisht all that, we will have done a great deal to make this a healthier and wealthier land.

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THE ECONOMIC IMPORTANCE OF THE FEDERAL INSPECTION OF MEATS AND MEAT-FOOD PRODUCTS DESTINED FOR COMMERCE.

By GEORGE DITTEWIG, D.V.S., Bureau of Animal Industry, United States Department of Agriculture, Washington, D. C.

The Federal inspection of meats and meat-food products is of economic importance in three particular respects. First, it is the instrument by which an important part of the export commerce of the United States has been secured and preserved; second, it is a service in hygiene and sanitation of incalculable benefit to the country at large and, efficiency considered, is rendered at an extremely low cost; and third, it actually and potentially is the most thoroly equipt agency thru which may be gathered the data necessary to the success of any broad program having for its object the conservation of the nation's meat-food supply thru the eradication of damaging and destructiv diseases from the food animal herds of the country. It has other elements of lesser economic importance which need not be enumerated, but before proceeding with a presentation of the facts upon which the foregoing is based, a brief statement regarding the Federal meat inspection service as a whole will conduce to a better understanding of its economic values and possibilities.

Federal meat inspection is conducted under the provisions of the Act of Congress of June 30, 1906, commonly designated the "Meat Inspection Act," the purpose of which is to prevent the use in interstate or foreign commerce of meat and meat-food products which are unfit for human food. In brief, this law authorizes the Secretary of Agriculture, at his discretion, to make, thru inspectors, an ante-mortem examination and inspection of all cattle, sheep, swine and goats to be slaughtered, and the meat and meat-food products of which are to be used in interstate or foreign commerce, and it directs the Secretary to make, thru inspectors, a post-mortem examination and inspection of the carcasses and parts thereof, and an examination and

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inspection of all meat-food products, of all such animals prepared for human consumption at any slaughtering, meat canning, salting, packing, rendering, or similar establishment for transportation as articles of interstate or foreign commerce. If, on such post-mortem inspection, the articles are found to be wholesome, within the meaning of the law, it is the duty of department inspectors to mark them "Inspected and Past," and, if not, to mark them "Inspected and Condemned." Condemned articles are required to be destroyed for food purposes in the presence of an inspector. Inspection of meat and meat-food products derived from the animals mentioned, prior to entering into interstate or foreign commerce, is mandatory, except in the case of retail butchers and retail dealers supplying their customers and of animals slaughtered by a farmer on the farm. The law prohibits meat or meat-food products being sold or offered for sale in interstate or foreign commerce under any false or deceptiv name, and it provides that the Secretary shall prescribe the rules and regulations of sanitation under which inspected establishments shall be maintained, and that he shall make, from time to time, such rules and regulations as are necessary for the efficient execution of the provisions of the statute.

The meat inspection regulations based on the Act require that the proprietor or operator of every slaughter or food-preparing establishment to which the law applies shall make application to the Secretary of Agriculture for inspection. Retail dealers who are granted a qualified exemption under the terms of the law must make application for such exemption. When an application for inspection is received by the Department, the establishment to which it refers is examined by an inspector of the Bureau of Animal Industry under which the service is administered and the applicant is advised as to the requirements of the regulations relativ to the facilities to be furnisht by the establishment for the conduct of the inspection; also as to the corrections and improvements to be made, if any be needed, for placing the plant in a sanitary and otherwise satisfactory condition. When the inspection facilities have been provided, and the defects as to the sanitary conditions corrected, an official number is assigned

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by which the establishment is designated and its products identified. Inspectors are stationed at the establishment to conduct the inspection.

With reference to the opening statement that the Federal inspection of meats is a service in hygiene and sanitation of incalculable benefit to the country at large, and that this service is performed at an extremely low cost, the following facts and figures are cited:

In the fiscal year ended June 30, 1914, inspection was maintained at a total of 893 establishments in 244 cities and towns in the United States. The total of animals inspected at the time of slaughter was, in round numbers, 56,909,000, divided as follows: cattle, 6,724,000; calves, 1,814,000; swine, 33,289,000; sheep, 14,958,000; goats, 121,000. The number past on the slaughter inspection was 56,473,000. The number of carcasses past under special restrictions, that is, for rendering into lard or tallow under a sterilizing process, was 154,900. The number of whole carcasses entirely condemned on this inspection and which were destroyed to prevent their use for human food was 281,300. The number of carcasses retained on the post-mortem inspection for the removal and condemnation of a part affected with some disease or condition which rendered the part unhealthful or otherwise unfit for food without affecting the remainder of the animal was approximately 3,000,000. In addition to the carcasses condemned on the slaughter inspection, there were condemned for various causes, on the ante-mortem inspection, including those found dead or in a dying condition, 66,700 animals.

The reports covering inspections and reinspections of meats and products prepared and procest in the establishments aggregated several billion pounds, while the quantity of meats and products condemned on such reinspections on account of having become tainted, rancid or otherwise unwholesome amounted to several million pounds.

Under the tariff act of October 3, 1913, meats and meat-food products are admitted into the United States free of duty, subject, however, to the inspection requirements prescribed by the

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Secretary of Agriculture. The regulations governing the inspection of imported meats are similar to those prescribed under the Meat Inspection Act for domestic meats and products. The imported meats and products inspected from October 4, 1913, to June 30, 1914, the first nine months of the operation of the new tariff law, were 197,389,348 pounds.

The force employed in the entire service numbers about 2400 employees, appointed under the United States Civil Service requirements. There are approximately 760 veterinarians, graduates of accredited colleges, and 1500 "lay inspectors" who are trained laymen, the remaining number being made up of administrativ officials, specialists, laboratory inspectors, and clerical forces.

The sum appropriated by Congress for meat inspection for the fiscal year 1914 was $3,200,000, within which sum the service was maintained. In other words, the cost to the people of the United States was less than six cents for each of the 56,909,000 animals slaughtered. This charge of less than six cents per animal covered the entire inspection from the first inspection of the live animal to the final examination of the meats and the finisht products when ready for delivery to dealers or consumers. This low cost is not attained at the expense of efficiency in the service. In fact, the reverse is the case, in that it is the constant endeavor to improve and strengthen the service. The advantages residing on the side of the Federal inspection in respect to cost of operation are: wide-spread and effectiv organization, training and specialization in duties, and heavy volume of operations upon which to compute unit cost. It would be quite impossible for any state or municipality in the United States to maintain for itself a system of inspection of the same completeness and efficiency except at a ratio of expense very much in excess of that of the Federal inspection. Inasmuch as upwards of 60 per cent. of the cattle, sheep, swine and goats slaughtered for food in the United States are inspected under Federal inspection the economic benefit accruing to the community at large thru the Federal service is apparent.

With reference to the declaration that the Federal inspection

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of meats and meat-food products secured and has preserved an important part of the export commerce of the United States, it may be stated that commercial and economic necessity was the chief consideration leading to the earliest enactments by Congress providing for meat inspection. (Acts of August 30, 1890, and March 3, 1891.) Entrance to foreign markets was necessary for the disposal of the great surplus of food animals and meats produced in the United States. Prohibitions and restrictions had been raised to such an extent by different foreign governments against the importation of American meats that inspection and certification by our Government to overcome them became necessary. Accordingly, the laws referred to were enacted by Congress, inspection was establisht and certification provided as to the soundness of the animals and of the wholesomeness of the meats past under such inspection. The result was expansion in the export trade in meats and food animals with corresponding benefit to the agricultural interests of the United States. These laws did not contemplate an inspection so broad and effectiv as the one provided for by the Act of June 30, 1906; nevertheless, there was built up a system of competent inspection for all the meats exported to countries requiring certification by this Government, and a like inspection for a high per cent. of the fresh meats shipt interstate in the United States. Moreover, when the present law was enacted the organization which had been formed was qualified to take up the work of carrying its broad and more stringent provisions into effect.

The need of the Federal inspection of meats and meat-food products destined for export is necessary to-day as in the past, notwithstanding that the United States has become a meat-importing country. The decline in domestic production which has led to these importations has been very markt as regards fresh beef and mutton, but there continues to be a considerable surplus in certain lines of pork meats, lard, oleo oil, edible tallow and lard substitutes for which foreign markets must be had. The requirements of foreign governments relativ to the certification of meats admitted by them have increast rather than diminisht, and an inspection that will meet them remains an eco-

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nomic necessity. The number of pounds of all forms of meat and meat-food products derived from cattle, sheep, swine and goats exported under Federal certificates of inspection has been substantially as follows, the years cited being the Federal fiscal years, and the amounts stated in round numbers: In the five-year period from 1898 to 1902, inclusiv, the lowest annual exportation was 640,000,000 pounds, and the highest 766,000,000 pounds. In the five-year period from 1903 to 1907, inclusiv, the lowest annual exportation was 531,000,000 pounds, and the highest 1,360,000,000 pounds. The explanation of the great increase indicated in the last-named total is that, beginning with 1907, the certifications were made to include certain meat-food products, for which, prior thereto, certification had not been required. In the five-year period from 1908 to 1912, inclusiv, the lowest annual exportation was 815,000,000 pounds, and the highest was 1,545,000,000. For the fiscal year 1913, the exports were 977,000,000 pounds, and in 1914 they were 904,000,000. For the first eight months of the current fiscal year, July 1, 1914, to February 28, 1915, the exports total 775,000,000 pounds.

That the Federal meat inspection service is the most effectiv existing agency for collecting, on a broad scale, data absolutely necessary to the success of any extensiv program for the eradication of certain diseases from the food herds of the country can be readily shown. More particularly such diseases as tuberculosis and certain serious parasitic affections, the presence of which is not suspected in the living animal until the damage they do is beyond remedy and the losses they cause are beyond prevention. The eradication or a material reduction in these diseases will lessen enormously losses on the farm, and in a corresponding measure remove the cause of the losses from condemnations under inspection. Every success in this direction is a material advance in the conservation of the nation's possible meat-food supply. No country should deem itself so rich that it may be indifferent to losses of this character. Measures for their reduction or elimination should be employed and at least two ways in which meat inspection is concerned are open for efforts in this direction. The first is to see that the rules governing condemna-

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tion on inspection are based on sound principles and that they are intelligently applied so that unwarranted condemnations shall not occur. The second is that means be devised and effected for the eradication from affected herds on the farms of diseases which, by their presence, make meats dangerous or otherwise unfit for human food. These proposals will be discust in their order.

The first proposal has been substantially met under Federal inspection in that the rules of condemnation on account of disease have been prepared by scientific and practical experts and, moreover, essentially conform to the views exprest by a commission of seven men outside of the Department convened in 1907 by the Secretary of Agriculture to study the subject and express opinions upon the disposition of carcasses affected with various diseases and abnormal conditions. This commission was composed of eminent pathologists and hygienists headed by Prof. William H. Welch, of Johns Hopkins University, as Chairman. That the regulations are intelligently applied is indicated by the fact that all condemnations on the post-mortem inspection under the Federal system are determined by graduated veterinarians and then only by such veterinarians after they have received instruction in the practical application of the rules after admission into the service. Therefore, important reductions in the losses under inspection on account of diseases or other conditions that make meat dangerous or otherwise unfit for food cannot be made without impairing the safeguards which it is the function of meat inspection to establish and maintain. The procurement of reductions in this way cannot be given favorable consideration. Therefore, recourse to the second proposal must be had.

The economic importance of the Federal meat inspection in relation to the eradication of disease from food herds lies in the fact that territorial areas and localities in which the obscure diseases referred to prevail to a damaging extent must first be known before any extensiv plan of eradication can be carried into effect. This information the Federal meat inspection system is best equipt to supply. Its inspectors, stationed in

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many states, make actual post-mortem examinations of upwards of 60 per cent. of the cattle, sheep, swine and goats slaughtered for food in the United States, and in every case where disease is found the diagnosis and the character and the extent of the lesions are made a matter of record. This information, used in conjunction with livestock shipping records is sufficient in most cases to fix the territory of origin, and in many cases is sufficiently complete to lead to an identification of the farms and herds that supply diseased animals for slaughter. With the perfection of shipping records and other means of identification, inspection data could be supplied even more rapidly than it could be used under any probable scheme of eradication. The value of information thus collected has been proved in important instances where it has been used for disease-eradicating purposes. However, the Federal Government is without sufficient authority to enter the states without their consent to inaugurate independently so important and beneficial a project. Therefore, an adequate exercise of their police powers by the several states in which the diseased herds are found will be essential to success. It is not too much to hope that the time is not distant when an enlightened public knowledge and appreciation of the importance of such a program of disease eradication will lead the states to grant their officials the power and support necessary to its success. When that time arrives, the Federal meat inspection service will be found ready to provide in great volume the essential data, and in other ways contribute to the success of the undertaking.

That the Federal inspection of meats and meat-food products destined for commerce possesses great economic importance the facts submitted show, but of far greater value and of higher importance than this is its service in the field of hygiene, sanitation, and protection of the health of the people.

DISCUSSION.

DISCUSSION OF PAPERS OF DRS. PENNINGTON AND CLARK, WEBSTER, STUBENRAUCH, DORSET, AND DITEWIG.

Dr. M. E. Jaffa, Berkeley, Cal.:

I think there is no doubt but what there should be control of all food products intended for commerce. At the same time, if our laws were as they

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should be, that question would take care of itself. We should have uniform laws, not only between the states, but between the states and the national government. If the laws were uniform with reference to the control of the preservation and preparation of foods, we would not have to think or consider the question of control of food for commerce, because each state would have similar laws and it would be taken care of.

A large number of instances could be given showing the necessity of control. I will give only one or two. Take the case of vegetables. We all agree that vegetables should form part of the diet. In many places it is impossible to get fresh vegetables. There we should have them dried and such drying should be controlled. For instance, in the case of the potato, which has great hygienic value, notwithstanding some opinions to the contrary. The potato can be dried without preservatives and remain in a first-class edible condition. But someone wisht to put on the market a nice white product, and they bleacht it with sulphur. The result is that such a potato will show a high content of sulphuric acid which is poison. If proper laws controlled, that would be prevented.

The same is true in reference to fruits. In the drying of some, where it is almost essential, the sulphur process should be used to a limited extent. Here again, control is necessary. With some fruits there is no necessity for it whatever; for instance, grapes. In seedless grapes we find the amount of sulphurous acid is below the limit allowed by certain countries and even below the limit indicated by Food Inspection Decision No. 76. At the same time there is a large amount of sulphuric acid. Oxidation does not take place so rapidly in the apricot, peach, pear, or apple. Furthermore, fully 90 per cent. of the pitted fruits are soakt and washt before consumption and thus a very generous amount of the sulphurous acid is removed and this loss is still further augmented by cooking. Not so with sulphured grapes. These are rarely washt or soakt before cooking. They are either eaten raw or in cake, bread, etc. In either case there is ingested with the raisin the injurious acid compounds. Similarly as regards the desiccated bleacht potato.

Another example of the necessity of controlling the preparation of fruits is the case of the olive. People do not realize the dietary value of the olive. It is considered as a relish, but it is not so. A pound of ripe olives contains $^{11}/_{12}$ the caloric value of a pound of bread. Unfortunately, there is a product labeled as ripe olives which is not true to name. It is a green olive, pickled to represent a ripe olive, and instead of from 20 to 25 per cent. of oil, it has sometimes less than 13 per cent. Again, unfortunately, there is a tendency on the part of some to increase the size by over irrigation, and thereby decrease the food value. That, again, should be controlled. The whole subject of putting the ripe olive on the market should be supervised. It may be said that the University intends, this Fall, to undertake an investigation of conditions along this line with a view to betterment.

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Transportation: The ripe olive, when it is improperly pickled, will not bear transportation and arrive at its destination in first-class condition. That is due, again, to the fact that the olives, when they are pickled, are not carefully sorted and selected so that soft ones will not be included. The process of pickling and preserving should be controlled.

Refrigeration: There is a great prejudice against refrigeration. The refrigeration of to-day and that of twenty years ago are as different as night and day. If it were not for this method of preserving food the consumer would have to pay a large amount for food products which they get now for lower prices. If eggs are placed in refrigeration *fresh*, they will come out in first-class edible condition. The consumer can preserv eggs in his own home, so that they will be in first-class edible condition. He may buy them when they are low in price, and preserv them by means of water-glass, so that when they cost fifty or sixty cents, he can get that nourishment at a much lower cost. The question again is to remember that they must be preserved in a fresh state. After they are three or four days old, degeneration commences and we cannot preserv them.

Many more points I would like to discuss, but the time is up and I do not want to hear the hammer.

(After request to continue.)

I wish to add to my remarks in connection with the preservation of different foods and also their nutritiv value, as illustrating the general principle that the total nutritiv value should not be considered only from the standpoint of the chemical analyses of the materials as purchased. If rice and olives, for example, are compared, it will be said immediately that a pound of olives has not the food value of a pound of rice. This is true in the raw state, but rice cannot be eaten raw. It must be cookt. It then contains at least 50 per cent. of water. Comparing a pound of cookt rice with a pound of ripe olives, the olives will show a far higher nutritiv value.

Let us consider the matter of meat and cheese. Cheese is very concentrated, containing about 25 per cent. of water, upwards of 30 per cent. of fat, and 25 per cent. of protein. One could hardly eat half a pound of cheese at a meal, whereas the case is entirely different with meat. This point is often lost sight of when tables of food values are compiled.

I wish to emphasize again the fact that refrigeration is a blessing to the consumer if the practice is properly carried out and if the food control laws are properly enforced. Cold storage operations to-day, as before stated, are entirely different from those of years gone by. In the case of eggs, entire buildings are used solely for the storage of this article of food, no other food materials being allowed in the same building.

It is true that there has been in the past, and there is still to-day, a prejudice in the minds of many against the cold storage egg. This prejudice, however, we feel confident will soon be removed, provided the food control laws with reference to cold storage are strictly enforced. In the past it was unfor-

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tunately a common practice for certain dealers to take one case of first-class cold storage eggs and two cases of fresh eggs, and in a very few minutes have three cases of "fresh laid eggs." The cold storage eggs which could not "pass muster" were sold under the label "cold storage eggs." These eggs should never have been sold at all. They should have been destroyed or not used for human consumption. If such a practice had been adhered to and only first-class cold storage eggs sold as such, there would have been no prejudice to-day existing with reference to the cold storage egg. It would be a somewhat difficult matter for a chemist to prove to a judge and jury the difference in food value between a first-class cold storage egg and an ordinary fresh egg.

In our laboratory we have workt out certain methods by which we have been able to prove to a judge and jury whether or not an egg is fresh in the common usage of the word, and we can readily tell, provided we know the temperature at which the egg has been kept, how old the egg is. Again, we can say such and such an egg is of a certain age had it been kept at say 60° F. If, on the other hand, the egg had been kept at 70° F., then the age would be different, etc., etc. We have conducted many successful legal prosecutions by the use of our laboratory methods, such prosecutions having been the means of bringing about an appreciable reform in the sale of eggs.

Dr. Woods Hutchinson, New York:

We have enjoyed very much the exceedingly interesting, pointed, practical remarks made by Dr. Jaffa. He has rendered a great service in calling attention to the popular prejudice which exists in regard to the use of preservatives. The most important preservativ is good common sense, and I hope we are going to have a little relief from the brass-band hysteria that has been sweeping over the country in the condemnation of all sorts of preservatives, most of which have been found absolutely harmless. The crusade against benzoate of soda comes under that absolutely. The best comment was made by Abe Martin. He said, "Grandma didn't know nothin' about benzoin of soda. She hid her jellies to make 'em keep." The question of preservatives should be lookt at from an intelligent, broad, common-sense point of view, and not from some special wild campaign carried on by so-called food chemists.

Dr. Emma B. Culbertson, Boston:

Just one point in connection with the paper on the preservation of fish; in justice to Boston, I would like to say that the whole question of the preserving and preparation of food products was brought out vigorously a few years ago in connection with poultry. The poultry had not been drawn before placing in cold storage! Experiments proved that the chickens which had been carefully cleaned and then placed in cold storage deteriorated much faster than the intact fowl. So there was method in the madness of the Boston market.

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Dr. E. D. Clark, Washington, D. C.:

The question of drawn and undrawn poultry is outside of my line, because I am especially charged with the study of fish and fish products. But I have been in the laboratories where a great deal of the scientific work is done, and I believe it is true that it is better from many points of view to not draw the poultry. Of course, a moment's thought will show you why this is. As soon as you open the body cavity of the bird, it means two things will happen. The blood will be smeared all over the inside of the body cavity, and also a certain amount of the intestinal content. That makes ideal bacterial culture ground. The washing is never complete, because you cannot get any man to wash thousands of poultry as thoroly as is necessary. Some have thought that wiping dry would remove this contamination. That is also difficult to carry out for the same reason. As Dr. Jaffa said, in all things we must be guided by common sense. I believe there is a great deal of reason for thinking poultry should be shipt and handled in the undrawn state. If conditions could be absolutely controlled and were ideal where the poultry was drawn and handled, drawing probably would be the better way, as in a person's own home, but in a large scale production it would be a difficult thing.

In regard to the question of refrigeration and the better handling of food products, it has pleased me very much to hear the gentleman interested in the transportation of fruit say that refrigeration is the keystone in that business, and also that the same is true in the milk business. It is also true in practically every business there is that involves the handling and transportation of perishable foods. If there could be some way, thru government agencies, or thru the agency of physicians among their own patients, that some of this prejudice against cold storage could be removed, it would be a very good thing. It would be much fairer, in the first place, to the people. There is one point involved that most people overlook. It is simply the question of economics. It costs perfectly good money to store products and hold them in storage. You have the charge for the storage and refrigeration; you have the charge of handling and putting the products in; you have the charge of the container, which is a large item; and you have insurance on the product. Every day your charges are heaping up. The lesson is, that the man who has any product in cold storage is going to take it out at the first time the market warrants him in doing so and making a profit. There would be no temptation whatsoever for a man to keep any product over from one fresh season to another fresh season. If we are dealing with mackerel, for instance, there is no reason for holding them more than from one July to the next July. As a matter of fact, if you go to the large storage plants in New York or other eastern cities, you will see that the mackerel is used up pretty well by the end of six to eight or nine months. There is a great deal of legislation that is rather unfair. This legislation seems to have been accomplisht by people who are extreme in their views on cold storage.

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They go on the assumption that cold storage is the means of monopolizing and cornering the market. There is no supply of any cold-storage product that can be monopolized, for very obvious reasons. The expense is too great for anyone to do that unless there is a certainty of unloading at a time when that particular commodity is not to be had. Whether it is the fruit industry, the milk industry, or the egg industry, the thing you must do is to see that your product is handled in a proper and sanitary way, that it is first class when it goes into cold storage, that it is treated in a proper way while there, and that it is labeled for what it is and sold for what it is. Unfortunately, no grocer, if he can help it, ever willingly sells cold storage goods. There is a sign up in some cases, "Cold storage goods handled here," but that does not tell how many. He takes a case out of cold storage plant, and will sell you different grades of eggs from it all the way from 60 to 23 cents, in accordance with what you like to buy. The chances are many that they are exactly the same eggs. But people will not buy cold storage eggs as such, and therefore he merely changes the label, and says "Fancy ranch eggs." That is extremely unfair to the people, because, as all of the speakers here have brought out, it is necessary for the conservation of perishable food.

Dr. H. H. Hicks, San Francisco:

I have nothing to add, except possibly to emphasize the fact that about 60 per cent. of the meat and meat-food products of the United States are killed and prepared under Federal supervision, and we feel that we can assure you that wherever you go, when you see the mark "U. S. inspected and past," on a piece of beef or on a case of meat-food products, you can eat such product with a clear conscience, and you can advise your patients and friends and everybody that it would be well to look for that mark. In cases where they cannot get it, they should do the next best thing and look for inspection marks of municipalities, counties, or perhaps states, where they maintain inspection which, in almost every case, is based upon Federal inspection, and in many places very nearly approaches it in value and efficiency. The public ought to be educated to look for the inspection mark on meats and meat-food products.

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LEPROSY AS A NATIONAL AND INTERNATIONAL PROBLEM.

By Frederick L. Hoffman, LL.D., Statistician, Prudential Insurance Co., Newark, N. J.

At the second International Conference on Leprosy, held in Bergen, Norway, August 15–19, 1909, the following named countries were represented by official delegates: Argentine Republic, Belgium, Bulgaria, China, Cuba, Denmark, England, France, Holland, Italy, Japan, Norway, Portugal, Russia, Spain, Sweden, Germany, Egypt, Austria-Hungary, and the United States of America. The enumeration of these countries is sufficient to emphasize the world-wide aspects of the leprosy problem and its significance to the United States. There are, unfortunately, no trustworthy and complete statistics regarding the extent of leprosy thruout the world, and not even for the United States are the data complete and sufficient to warrant definit conclusions. On the occasion of the congress referred to the number of lepers on the mainland of the United States was estimated at 146; for the Hawaiian Islands, 764; for Porto Rico, 17; for the island of Guam, 19; for the Philippine Islands, 2,330; and for the Panama Canal Zone, 7; a total of 3,283 for the United States and its non-contiguous possessions. There are strong reasons for believing that the number of lepers on the mainland is much larger than the number returned by the leper census for the year referred to. No thoro inquiry has ever been made to ascertain *all* of the ascertainable lepers, even in theState of Louisiana, but it is a safe assumption that not half the existing number are actually being taken care of at the leper home of that State.

Outside of the mainland of North America leprosy in the western hemisphere in 1909 was distributed in part as follows: In Cuba there were 1,297 cases; United States of Columbia, 4,152; Argentine Republic, 12,000; and the island of Jamaica, 115. For all other islands of the West Indies and the countries of South and Central America the information was not obtainable.

In 1912 a further effort was made to determine the number

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of lepers in the United States and its noncontiguous possessions. The total number of new cases reported during the calendar year 1911 was 1,217, and the number of cases reported as present on January 1, 1912, was 3,478. Of this number, 146 were reported for the mainland, 696 for Hawaii, 2,754 for the Philippine Islands, and 28 for Porto Rico. Cases were reported for the several States as follows: Arizona, 1; California, 23; Connecticut, 1; Florida, 2; Indiana, 1; Kansas, 1; Louisiana, 71; Massachusetts, 13; Michigan, 1; Minnesota, 18; New York, 5; North Dakota, 1; Pennsylvania, 3; Rhode Island, 1; Utah, 1; Washington, 2; and Wisconsin, 1.

The ascertainment of the extent of leprosy thruout the United States has been by means of a circular letter of inquiry, sent out by the Surgeon-General of the United States Public Health Service, to the health authorities of the several states. There are no means at the present time, however, by which the true extent of leprosy can be determined with absolute accuracy. It may properly be questioned whether more than a small fraction of the physicians thruout the country are qualified to diagnos a case of leprosy in the initial stages. It is often difficult to even diagnos a case after the disease has made considerable progress. The disease is reportable in only 19 states, as follows: Alabama, California, Connecticut, District of Columbia, Florida, Idaho, Illinois, Indiana, Iowa, Massachusetts, Nebraska, New Jersey, New York, Oregon, Pennsylvania, South Carolina, Utah, Washington, and Wisconsin. The disease is possibly reportable also in Michigan. It is apparently not reportable in the most important state, and that is Louisiana. Since only the city of New Orleans is within the registration area, deaths from leprosy thruout the remainder of Louisiana are not at present a matter of record with the Division of Vital Statistics of the Census. The number of deaths from leprosy in the United States registration area in 1912 was 11, and in 1913, only 6. The mortality rate per 1,000,000 of population was 0.18 for 1912, and 0.09 for 1913. The largest number of known lepers on the mainland is in the State of Louisiana, where for a number of years segregation has been practiced and where the known lepers are taken care

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of at the leper home at Indian Camp Plantation. For the last fiscal year the number of patients on record was 97 and the number of new patients received during the previous year was 25. The only other state leper settlement on the mainland is on Penikese Island in Buzzard's Bay, being one of the group of the Elizabeth Islands, which lie directly north of the western end of Martha's Vineyard. Occasional lepers are taken care of elsewhere in a more or less unsatisfactory manner, as perhaps best illustrated by the case of the District of Columbia, where two lepers are at present provided for in an isolated location on the river front, where they are virtually permitted to look out for themselves as best they may. That is to say, they are not under the constant care of a qualified dermatologist, but receive such occasional medical treatment as they themselves may think necessary. It is suggestiv in the case of the two lepers now being taken care of by the District of Columbia that they are both former residents of the Philippine Islands, where, in all probability, they contracted the disease.

At San Francisco, within the city limits, a leper settlement is maintained by the city in connection with the Isolation Hospital, where some fifteen patients are being taken care of in an efficient and humane manner. The San Francisco Institution illustrates the possibility of leper maintenance without opposition on the part of the public, and at the same time reflects an advanced humanitarianism of the community while suggesting a way out of the practical difficulty of effectiv leper care at reasonable cost when only a few patients have to be provided for.

There has been no comprehensiv statistical investigation of the frequency of leprosy thruout the world, but some exceedingly suggestiv data are available for the countries with which the United States are most concerned. In the registration area, which comprehends about 65 per cent. of the total population, there were 95 deaths from leprosy during the period 1900–13, equivalent to a mortality rate of 0.15 per 1,000,000 of population. Considering that each and every death represents a case more or less a menace as a focus of the disease, and furthermore that the statement is exclusiv of the deaths

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at the Louisiana leper home, it needs no further argument to sustain the conviction that the disease requires to be given more serious public consideration.

It is true, of course, that at present the disease is of very limited extent in the United States. Even in Louisiana, where leprosy has been endemic for more than two hundred years, the comparativ leprosy frequency is only 4.9 per 100,000 of population, compared with 44.4 for the Philippine Islands, 130.3 for British Guiana, and 294.3 for the Territory of Hawaii. According to the last official report, there were 87 lepers at the Louisiana leper home, equivalent to a ratio of 4.9 per 100,000 of population. It is a conservativ estimate that there are probably twice that number, if not more, lepers at large, chiefly, however, in the remote and sparsely populated extreme southern parishes of the State. Of the Louisiana leper patients, 51 per cent. are white males, 25.9 per cent. white females, 14.0 per cent. colored males, and 9.1 per cent. colored females. The average age on admission is about 38 years. The type of the disease in Louisiana is the anaesthetic in 36.5 per cent. of the cases for the white patients, and 30.3 for the others. The remainder, or 66.8 per cent., is the mixt and nodular types combined.

In Hawaii, at the settlement at Molokai, the present number of lepers is about 660. Largely as the result of effectiv segregation the number of lepers in the Territory is gradually declining. The number of new cases during the decade ending with 1913 was 719, compared with 1,033 new cases during the decade ending with 1903. Of 1,060 lepers admitted during 1901–13, 867, or 81.8 per cent., were Hawaiians or part Hawaiians; 98, or 9.2 per cent., were Chinese, Japanese and Koreans; 52, or 4.9 per cent., were Portuguese; and only 27, or 2.5 per cent., were Caucasians other than Portuguese. In 1910 the proportion of Portuguese population of the total was 11.6 per cent., which contrasts with only 4.9 per cent. of Portuguese lepers at the settlement. In the same year the proportion of other Caucasians in the population of the Territory was 11.4 per cent., which contrasts with only 2.5 per cent. of lepers at the settlement. It is shown, therefore, that the disease is largely confined to the nativ and Oriental populations of Hawaii,

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and that the proportion of cases among them is excessiv. Out of 1,060 cases of leprosy during the period 1901–13, 327, or 30.8 per cent., were of the anaesthetic type.

Leprosy in Hawaii is relatively and actually on the decline. This satisfactory result is primarily to be attributed to the effectiv plan of segregation at Molokai. The conditions of home life, supervision and treatment are ideal. The settlement may safely be considered a model of its kind, and in addition thereto the territory maintains a receiving station just outside of Honolulu for incipient or other early cases under observation. The leper law of Hawaii is both effectiv and humane. The complete records of each case are an admirable illustration of the scientific point of view governed by sound medical and humanitarian consideration. As yet, however, no comprehensiv analysis has been made of the large amount of material in the archives of the territorial Board of Health. Such an analysis would constitute a most valuable contribution towards the scientific study of leprosy, with a due regard, of course, to all the essential elements of age, sex, race, and precise place of origin.[1]

The results achieved in Hawaii find their parallel in Norway. Under a policy of effectiv segregation the leper ratio has been gradually reduced from 191.3 per 100,000 of population in 1856 to 61.9 in 1885, and to 13.5 in 1910. A thoroly digested statistical report is publisht at quinquennial periods by the Government of Norway, amplified by medical and other observations of a scientific nature.[2] As a concrete illustration of the remarkable diminution of leprosy in Norway, it may be stated that between 1857 and 1875 there were 3,062 new admissions to the leprosariums, diminishing to 1,108 during the first ten years, to 817 during the decade following, to 327 during the ten years ending with 1905, and to only 88 cases during the five years ending with 1910. No such comprehensiv statistical account has been publisht regarding leprosy for either Louisiana or Hawaii.

That the lesser numerical extent of the disease on the main-

[1] "Studies upon Leprosy," by George W. McCoy, M.D., U. S. Public Health Bulletins Nos. 61 (July, 1913) and 66 (September, 1914).

[2] "Leprosy in Norway (De Spedalske i Norge), 1906–1910," Norway, Official Statistics Vol. 161; Christiania, 1912.

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land of the United States is not a justification for the neglect to give full publicity to the facts is best illustrated by reference to the twentieth report on leprosy in New South Wales for the year 1910. On January 1st of that year there were 19 persons remaining under detention at the leprosarium, and regarding these a report with extremely interesting illustrations, of some 30 pages, is publisht, and amplified by a precise but full account regarding each and every case. The report is a most valuable contribution to the scientific study of leprosy and deserves to be followed in every detail by the authorities responsible for the care of lepers in Louisiana, Hawaii, and elsewhere. Since 1890, when the leprosy law providing for compulsory detention became effectiv, 121 lepers have been admitted, and of this number 55, or 45.5 per cent., have died, 10 have been discharged, and 37 have been repatriated (chiefly to China), leaving 19 remaining on January 1, 1910. The cost of administration for the leprosarium at Little Bay, New South Wales, for 1910, amounted to £1,635 ($7,947), or an average per capita expense of about £90 ($438) per annum.

For the Territory of Hawaii, the amount expended on account of leprosy during the year 1912 was $231,778. The number of lepers cared for during that year was 728. The average per capita cost per annum was, therefore, $318. The Legislature of 1913 appropriated the sum of $412,130 for the care of lepers, including permanent improvements at the leper settlements for the two years commencing July 1, 1913. It may safely be asserted that no government in the world carries a proportionately heavier burden on account of the care of lepers than the Territory of Hawaii. It may also be asserted on the basis of my personal investigations and without fear of successful contradiction that nowhere are lepers more effectively and humanely taken care of than at the receiving station at Kalihi, near Honolulu, and at the permanent settlement of Kalaupapa, on the island of Molokai.

These observations suggest the question as to what is being done for lepers on the mainland. As previously stated, the largest number of lepers in the United States at the present time is to

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be found in the State of Louisiana, where for some twenty years they have been more or less segregated at the leper home located at Indian Camp Plantation, about 70 miles from New Orleans. During the last decade the conditions at the settlement have been materially improved, and the provision which is now made for lepers under segregation in Louisiana conforms quite fully to those of Molokai. The settlement has not, however, a physician in constant attendance, altho the number of lepers, according to the last report, was 87. The settlement is visited once a week by a qualified leprologist from New Orleans, and at other intervals if necessary. It has properly been observed that nothing will draw leper patients at large more quickly to a leprosarium "than the knowledge that the best special treatment for their trouble can be obtained only at the leper home." Special consideration, of course, requires to be given to the class of patients provided for. What is suitable and ideal for nativ Hawaiians, or Orientals, is not necessarily the best method of accommodation or treatment for French Creoles, or negroes, in Louisiana. There is no more grotesque public impression, however, than that a leper settlement is a living tomb, or a dreary, hopeless place of residence for what are considered, and properly so, perhaps the most unfortunate human beings on earth. Modern settlements such as those at Molakai and the leper home in Louisiana, provide all reasonable comforts and a fair amount of entertainment, with abundant personal freedom, governed, of course, by restraints imperatively called for by broader general considerations. For these reasons it is an inhumane and wrongful state policy to permit lepers to be at large, as contrary to both their own interests and the larger interests of the community. Nor is it advisable to isolate only a single leper, for both medical and humane reasons. The mere fact of absolute isolation or exceptional consideration is detrimental to the best possible treatment. It may seem incredible, but it is absolutely true that, in a general way, there is no more cheerful community than a large leper settlement such as the one at Molakai, or the one in Louisiana. On the other hand, there is perhaps no more dreary and unfortunate position than that of an isolated leper, ostracized from the rest of the community,

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and dealt with as an exceptional case. For these reasons, which, of course, could be amplified, it is of the greatest practical importance that several Federal leper settlements be establisht at convenient points thruout the country, for the greater comfort and more humane care of these unfortunates. What has been done in this direction by the State of Massachusetts is deserving of the highest praise, altho the number of lepers in that case, according to the last report, is only 15. The station on Penikese Island is conceded to be a model of its kind, and whatever is reasonable and advantageous is being done to make the life of these unfortunates as bearable as possible. The enlightened policy of the State of Massachusetts is in markt contrast to the uncalled for and drastic action in several states where the establishment of leper settlements has been strongly opposed. A few years ago it was suggested that a number of lepers in the State of Washington be sent to a station near Fort Thompson, on Puget Sound, but it was argued that "Puget Sound is not, and will not become, a leper colony and there is not a spot anywhere along its shores suitable for that purpose, and any attempt by the Government to develop a leper colony would be sure to arouse the bitterest resentment." The answer to this statement is that the essential facts of leprosy are generally misunderstood: that the disease, while unquestionably contagious, is only very mildly so, and practically not at all when reasonable sanitary requirements are complied with. On the occasion referred to, the argument was advanced that Seattle was one of the most healthful cities in the world, and the question was raised as to how the fact of a leper colony on Puget Sound would coincide with a campain to advertise the healthfulness of the State. It was therefore argued that many a man "who would never know that the Sound was distinctly healthful, would know that it was the seat of a leper home—and the result would be to turn him against the entire section." In reply, it may be said that the leper settlement at Penikese Island, in Buzzards Bay, has not in the least degree detracted from the enormous tourist and vacation traffic of that region during the summer months; that as far as known the public is paying not the slightest attention

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to the settlement, which is in precise conformity to the intelligence of the Massachusetts people and their humanitarian regard for the most afflicted element of the population, and that there is not the slightest possible chance that the settlement could in any manner affect the health of the near-by region. The same conclusion applies to the settlement in Louisiana, and the one at Molakai. It is not true, as observed in the newspaper discussion referred to, that leper settlements "are invariably shunned by people." It is, in fact, quite difficult to keep visitors away from Molokai, and the entire Legislature visits the settlement once a year, without any apprehension whatever. The superintendent in charge of the settlement. and the resident physician, as well as the Government experts, come and go without any let or hindrance and without the slightest apprehension regarding contagion on the part of anyone. Under proper sanitary conditions the risk of contagion is extremely slight. Leaving out of consideration the case of Father Damien there have been practically no cases of infection of white attendants at Molokai; but much to the contrary, some of the officials in charge, including the superintendent, the resident physician, the Sister Superior, and the Brother in charge of the Home for helpless cases, have been at the settlement for many years, and in daily, almost hourly, contact with cases in all stages of the disease, but happily without disastrous results.

The same conclusion applies to the settlement in Louisiana. The attending physicians are well known in New Orleans, and they are not considered in any manner, and rightfully so, as likely to be sources of infection. The Sisters in charge visit the city from time to time without let or hindrance, and it would be absurd to consider them in any way a menace to the community. These facts and observations should be fully sufficient to convince any person of average intelligence that a leper settlement is not, and can not by its nature be, a menace to the health of the community, but much to the contrary, its existence, granting necessity, reflects the highest humanitarianism and civilization of the community, broad-minded enuf, and charitable enuf, to aid in its establishment and maintenance.

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The maintenance appropriations for the Louisiana leper home, for the two years ended March 31, 1914, amounted to $46,500, but the total disbursements during the same period for all purposes, including improvement appropriations and cash donations, amounted to more than $76,000 net, or about $38,000 per annum. The total number of cases treated during the two years was 119, and the per capita expense per annum was $475. During the first ten years after the opening of the institution the average number of new cases admitted was 7.7, which compared with an average of 14.3 cases during the eight years ending with 1913. It is properly observed in the last biennial report that the most important factor in the exceedingly difficult problem of isolation "is an institution recognized by the medical profession *and the public* as a place to which lepers can be sent with the full confidence that they will receive the best care and be offered the greatest prospect of amelioration or cure." The same reasoning applies to the need of national institutions on a similar scale to provide adequate and humane treatment for the few lepers in sections in which the disease is less common than in Louisiana or Hawaii.

To much the same effect are the words of the Surgeon-General of the United States Public Health Service, Dr. Rupert Blue, in an address on "The Public Health Aspects of Leprosy in the United States," read before the American Medical Association in 1913. Dr. Blue remarks that "Every case of leprosy should be promptly reported to the proper health authority and, wherever necessary, the laws should be so amended and penalties provided for non-observance. All lepers should be segregated in such manner as to prevent the spread of the disease, but the necessary segregation should be enforced so as to promote the comfort and happiness of those so afflicted." Reasoning from this fundamental principle of national control, Dr. Blue suggests that "On account of the difficulty of providing these conditions in towns, counties and states where single cases of leprosy occur, and because of consequent inadequate methods of control, I believe there should be establisht under the Public Health Service a national leper home for the care and treatment of such cases as may be turned

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over by state and local health authorities for the purpose."

A bill was accordingly introduced into Congress (H. R. 1751) providing for the establishment of a national leprosarium. In his evidence before the Committee on Interstate and Foreign Commerce (there being no public health committee of the House of Representatives) Dr. Blue made the statement that at that time (December 15, 1914) leprosy existed in eighteen states of the Union, and that while in some states the disease was notifiable, in others it was not; and that while for himself he was convinced of the necessity of segregation, he was sorry to say that some health officers did not believe in drastic methods of control. Dr. Blue presented the following resolution, adopted by the Section on Dermatology, of the American Medical Association, June 24, 1914:

Resolutions favoring the passage of a Federal Law for the Care and Control of Leprosy in the United States, adopted by the Section on Dermatology of the American Medical Association, Atlantic City, N. J., June 24, 1914.

To the honorable house of delegates of the American Medical Association:

The section on dermatology of the American Medical Association respectfully submits the following resolutions, which have been unanimously adopted by the section on June 24, 1914:

WHEREAS leprosy exists in many foci in this country, and has been statistically shown to be on the increase; and

WHEREAS those afflicted with leprosy are being subjected to most inhuman treatment; and

WHEREAS many lepers are traveling in interstate traffic because of the inhuman treatment to which they are subjected, thereby constantly exposing the general public to the contagion; and

WHEREAS it is the duty of the Federal Government to control traffic between the States; and

WHEREAS, at the present time the care of lepers in the United States is a great economic burden on the individual States and is, moreover, of necessity inadequate from a medical and sanitary standpoint: Therefore be it

Resolved, That the Association recommends the passage by Congress of a law for the comprehensiv care and control of leprosy by the Federal Government.

This resolution is in conformity to the accepted principles of leprosy control adopted by the Second International Conference on Leprosy, held in Bergen, Norway, August 16–19, 1909. The resolutions adopted by the conference read in part:

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A. 1. The Second International Scientific Conference on Leprosy confirms in every respect the resolutions adopted by the First International Conference of Berlin, 1897. Leprosy is a disease which is contagious from person to person, whatever may be the method by which this contagion is effected. Every country, in whatever latitude it is situated, is within the range of possible infection by leprosy, and may, therefore, usefully undertake measures to protect itself. 2. In view of the success obtained in Germany, Iceland, Norway and Sweden, it is desirable that other countries should isolate lepers. 3. It is desirable that the children of lepers should be separated from their parents as soon as possible, and that they should remain under observation. 4. An examination should be made from time to time of those having lived with lepers by a doctor having special knowledge. It is desirable that lepers should not engage in certain trades or occupations. All leper vagabonds and beggars should be strictly isolated.

The fundamental principle of segregation underlies every effort at governmental administrativ control of leprosy as a menace to the public health. But the principle of segregation goes much further in that it also recognizes the humanitarian considerations, which are practically absent in any other form of treatment or method of control. It is a lamentable fact that in the United States, including some of our larger cities, there is still an attitude of more or less pronounced antipathy towards segregation under humane and otherwise reasonable conditions. There is, furthermore, a most serious indifference regarding the possibilities of leprosy spread thru lepers permitted to go at large or treated privately under conditions which preclude the possibility of an effectiv protection of the community. The available evidence is absolutely convincing and entirely conclusiv that wherever complete segregation has been practiced the disease has gradually diminisht. This certainly has been the case in Norway since 1856 and in Hawaii during the last twenty years. The argument frequently advanced that the number of cases in this country is insufficient to warrant drastic measures is but further evidence of the public indifference to the true aspects of the leprosy problem. The disease is so loathsome, so tragic, and so hopeless, that the menace of its needless spread to another single case from even the foci of one existing case is a risk which no civilized country can rightfully take. On the other hand the disease is so mildly contagious, and so difficult of transmission under proper hygienic

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conditions, that the inhuman treatment of exceptional lepers thruout the country is but evidence of our backward condition with regard to one of the most tragic disease problems of modern life.

Effectiv segregation is an expensiv matter and the burden upon a single state may assume prohibitiv proportions. An excellent illustration is the Massachusetts leper settlement at Penikese Island, under the medical administration of Dr. Frank H. Parker. The institution is administered by the State Board of Charities, and the plant is valued at $109,465. The normal capacity of the settlement is nineteen, or a per unit cost of nearly $6,000. The settlement provides hospital care and treatment exclusively for persons afflicted with leprosy. During the year 1913 seventeen patients were under treatment, of an average age on admission of 38 years. Eleven were suffering from the disease in the tubercular form, two in the anaesthetic, and two in the mixt form. The number of females was only four, or 23.5 per cent. out of the total of 17. A preponderance of male lepers has been observed in all countries for which trustworthy data are available. It is extremely significant that all of the patients on Penikese Island, with one exception, were of foreign birth or parentage, the races referred to being as follows: Chinese, 4; Portuguese, 4; Russians, 4; and 1 each from Japan and British West Indies. The expenditures for the year amounted to $23,390, of which $9,329 was expended for salaries, wages and labor, and the remainder on account of maintenance, etc. The ratio of the daily average number of persons employed, to the daily average number of inmates, was 1 to 4.7.

The provision which is made for the segregation of lepers in the State of Massachusetts closely approaches the attainable ideal. It is in conformity to the efficient and humane methods of segregation at Molakai and the Louisiana leper home. Several additional institutions are required for other sections of the country. More should be done for the State of California, where, according to the last report of the State Board of Health, there are approximately thirty cases taken care of under more or less doubtful conditions of effectiv segregation. At a meeting

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of the Board of February 7, 1914, a resolution was past which made leprosy a quarantinable disease under the laws of California. There were ten new cases of leprosy reported during 1913, but most of these were discovered in Los Angeles and San Francisco. There are reasons for believing that in California, or elsewhere, there are more cases than are officially reported and made a matter of record. Until a person afflicted with leprosy has the positiv assurance of adequate professional and humane care in suitable institutions under state or Federal control, the number of lepers at large is not likely to perceptibly diminish.

It would be difficult to determine with a reasonable approach to accuracy, the existing number of lepers thruout the continental United States. There are no reasons, however, why the fundamental principles of the leper law of Hawaii should not be incorporated at least in the regulations of all the more important state boards of health. Every leper is a serious menace to the community and his effectiv segregation is not only of great importance to the nation, but of equal importance to the leper himself. The proper treatment of leprosy requires special facilities which can not be had even in well equipt hospitals, to say nothing of the crude and often inhuman provision made for isolated lepers in quarantine stations or pesthouses. There would, therefore, seem to be no alternativ but to bring about the establishment of one or more national leprosariums under the direct administration and control of the Federal Public Health Service. The essential provisions of House Bill 1751 are as follows:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Treasury be, and he is hereby, authorized and directed to establish a national leprosarium in the United States or any of its insular possessions, the location thereof to be decided upon after proper investigation by the Surgeon-General of the United States Public Health Service, subject to the approval of the Secretary of the Treasury. The Secretary of the Treasury shall have power to acquire, by condemnation or otherwise, a suitable site for the leprosarium and shall erect thereon all necessary buildings and thoroughly equip the same for the proper care and treatment of lepers confined therein and for the investigation and study of the disease of leprosy. * * * * * * * *

"Sec. 2. That the Surgeon-General of the United States Public Health

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Service shall appoint all medical officers, assistants, surgeons, pharmacists and other necessary employees, and shall promulgate and adopt, subject to the approval of the Secretary of the Treasury, all necessary rules and regulations to carry this act into effect.

"Sec. 3. That, under authority of this act, any state or territory of the United States is authorized to transport all persons afflicted with leprosy found therein to the leprosarium, and the Surgeon-General is directed to receive the same, such transportation charges to be paid by the United States."

This bill, and others like it, have been before Congress for several years but final action has been deferred. It is sincerely to be hoped that final action will be taken by the next Congress, but additional provision should be made for the gradual acquisition by the Federal Government of existing state leper settlements, so that all lepers may be segregated in suitable leprosariums under complete Federal administration and control.

If this plan should be ultimately carried thru there would be an end to the existing intolerable situation. It would be utterly impossible to even briefly review the considerable number of lamentable cases of isolated lepers, which for the time attracted considerable attention but were soon forgotten, while the lepers themselves remained exposed to needless suffering and a menace to the community at large. Reference requires only to be made to the action on the part of the New York City health authorities in releasing a number of lepers from a temporary settlement on North Brother Island, to mingle with the community without let or hindrance, upon the erroneous assumption that leprosy is not contagious or transmissible from person to person in northern latitudes. As a matter of fact, leprosy is endemic and has been endemic in Iceland for many years, and the Louisiana focus probably had its origin in the maritim provinces, to which it originally may have been brought from Iceland or Norway. The number of lepers in Iceland at the present time is approximately 100. Only about two or three years ago the Commissioner of Health of the city of New York was quoted in an interview in *The Evening World,* to the effect that "leprosy can not be contracted in this climate." At the same time a distinguisht specialist was quoted to the effect that "In this region the presence

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of the disease is not a menace to the community;" and a physician attacht to the Metropolitan Hospital on Blackwell's Island was quoted as having declared that "In this climate the fear of leprosy is unwarranted." As far as known, climate has absolutely nothing to do with leprosy, and the cases which have been observed in far northern latitudes, including Minnesota, completely contradict the assumption that leprosy may not become endemic in this country, unless the known cases are immediately and permanently segregated under suitable conditions. The disease is frequently given only superficial medical consideration, as best shown in the well known Early case, which was declared by a specialist in skin diseases attacht to a well known New York hospital, not to be leprosy, in opposition to the unanimous judgment of a committee of the New York Society for Medical Jurisprudence. At the present time, or about two years later, Early is one of two lepers segregated under far from satisfactory conditions in the District of Columbia. The specialist was fundamentally wrong, and the community was exposed to a most fearful risk because of a lack of serious consideration of a case in its early but cognizable state. In a matter of such enormous importance to the community it would seem that the public at large is entitled to the benefit of a doubt until every reasonable suspicion of leprosy in a suspected case has been removed. The present hazardous and more or less superficial and inhuman treatment has been a matter of public record for more than twenty years. Cases after cases have temporarily attracted public attention, but being few in number they have not resulted in the development of a national sentiment favorable to the national control of the disease under suitable but effectiv conditions of segregation. For illustration: there was a case of leprosy in Columbus, Ohio, in 1898, which subsequently resulted in another case, the origin of the disease being traced to the father, whom, it was claimed, had contracted leprosy during the Civil War. In 1899, Dr. Herbert C. Moffatt exhibited a leper in the city of New York, who had possibly contracted the disease in Cuba or among the Aleutian Indians of Alaska. The patient in this case was a physician.

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A case occurred in West Virginia in 1906 which attracted much attention on account of the wanderings or interstate movements of the leper, which should early and promptly have required Federal interference. The case was found in a remote section of the State and it was reported at the time that "the public of the district where the leper is now sojourning was panic-stricken, and he has been much neglected, but the county has now taken him in charge, and will, it is said, build a house and provide for him." It would be difficult to conceive of a less satisfactory method regarding both the leper and the public at large. The treatment of leprosy, as said before, requires special methods and a thoro understanding of the symptoms of the disease, which is not likely to be met with on the part of the ordinary practitioner, most of all in a remote section of a state like West Virginia.

Some six years ago, the United States Army had an isolated leper, who was taken care of at Fort Screven, near Savannah, Ga. The leper was a first sergeant, and a cottage was built for him where, as far as practicable, he had every necessary medical attention. The Sergeant submitted with patience to every treatment, but under such conditions of isolation it is readily conceivable that the suffering must have been much greater than if provision had been made for him in a modern leprosarium.

There was a woman leper found in the city of New York in 1910, who had come from Baltimore two weeks previously, where the Board of Health had been making strenuous efforts for her apprehension and isolation. As reported in the New York newspapers at the time, sequestration or isolation would not be required in her case in the city of New York, upon the assumption that "the chances of communicating the disease are so slight as to make isolation unnecessary."

Perhaps the most interesting recent case occurred in 1911, in Pawtucket, R. I., where a 15-year old school boy was first discovered to be a leper in one of the isolation wards of the Massachusetts General Hospital. As reported in the newspapers at the time, "When news of the case became known in Pawtucket it caused a tremendous alarm, especially among families with children attending the same school." The home of the boy was

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surrounded by policemen, and complaint was made by the schoolteacher that she was being shunned on account of her possible contact with the boy, who was subsequently taken care of by the Rhode Island State authorities.

In the same year (1911) a case of leprosy was discovered in Pittsburgh—a Chinese bookkeeper, who was found afflicted with leprosy in a Chinese store, taken to the municipal hospital, and placed temporarily in a tent until a separate house could be erected for him.

Also in 1911 there was a case in Minneapolis where a leper was found to have suffered from the disease for twelve years, and the case was not diagnosed as leprosy until the man died, when an autopsy was performed. About the same time there was a case of leprosy in Jersey City which terminated in death, but following isolation of only a few weeks preceding.

In Paterson, N. J., there was a Chinaman who was taken from a laundry and died a few days later from leprosy, at the Isolation Hospital. It was reported that he had come out only about six months previously, and was supposed to be one of two lepers who had escapt from the quarantine at North Brother Island.

Mention may also be made of a family of lepers found on a ranch in Idaho consisting of the father and mother and two children. The father had been in Honolulu some years before and no doubt contracted the disease in the islands. There was also a case of leprosy in Fort Wayne—a Syrian woman who had but three weeks before come from Hawaii, where she had contracted the disease. There is also on record the case of a young man of 18 who, for four years, was afflicted with tubercular leprosy and taken care of in the Brooklyn Hospital for Contagious Diseases. This boy was the son of a tobacco merchant living at Key West, Fla., and he had probably contracted the disease in the South.

There was a Greek leper found in Chicago, who had escapt from quarantine in Salt Lake City, but who succeeded in passing thru to New York. Finally, mention may be made of a well known case of the widow of a general of the United States

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Army, who died from leprosy at the County Hospital at Los Angeles. She had formerly been living in Arizona.

Other cases could be mentioned, to re-emphasiz the conclusion that isolated instances of leprosy suggest the inadequacy and danger of any and all methods of treatment other than complete segregation in leprosariums under either state or Federal control, or both. The time has past for academic discussion, and the time for action has come. The evidence is overwhelming that leprosy exists to a much larger extent in this country than is generally assumed to be the case, and that the risk of its introduction from the West Indies, South America, the Philippines, and the Orient must be considered much greater at the present time than in former years. A carefully considered plan for national segregation, treatment and control has been brought forward by the United States Public Health Service, and the measure proposed is entitled to public confidence and adequate support. The proposed law providing for a Federal leprosarium will no doubt be brought before the next Congress, and its speedy enactment is called for by the highest considerations of public policy.[1]

DISCUSSION.

Dr. R. W. Corwin, Pueblo, Colo.:

I have visited the lepers in Hawaii, those at Molokai and Honolulu; also have seen lepers in Palestine, especially Jerusalem. The statement made by those in attendance was that they felt leprosy was not contagious. While they took every precaution to avoid contracting the disease, they had little fear from exposure.

Dr. George E. Ebright, San Francisco:

It would be very wrong to let such a paper as Dr. Hoffman's go without adding what emphasis one might to the necessity for segregation. The number of lepers in any county is so small—many times—for years a county will have none—and the preparedness for their proper care is not practicable. For that reason the care of lepers should not be a responsibility of the separate counties within the state; more than that, in as much as probably all of our lepers are foreign importations, as Dr. Hoffman has pointed out, the burden of their care should not rest upon the states but should be in the hands of the

[1] See my address and resolution presented at the Thirteenth Annual Conference of Federal and State Health Officials, Washington, 1915.

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Federal Government and presumably under the Marine Hospital and Public Health Service. Only such an institution as could be maintained by the United States Government could adequately meet the problem.

Dr. George A. Hare, Fresno, Cal.:

I do not wish to take the time of the Academy when we have so many excellent papers, but I do not want to let this occasion pass without expressing my thanks to Dr. Hoffman and my appreciation of his broad-minded presentation of this practical question. I am from Fresno and I am sorry to have any public health work of our county subject to such a severe criticism. The justice of this criticism only emfasizes the fact that the work of this Academy will not be completed until public officials are so educated along all the lines of medical sociology that the public health service will give to all unfortunate persons, including lepers, such humanitarian treatment as is in accord with the establisht truths of medical science. This paper will help to broaden our ideas regarding the care of lepers and will help to disseminate a broad-minded knowledge among our associates. I want to thank the doctor again for this good paper. The doctor made one statement that no case of leprosy had ever occurred in America. Does he mean that no case ever originated here, or does he mean that no persons ever contracted the disease here except those who have come in contact with leprosy in other countries?

Dr. C. W. Hopkins, Chicago:

Regarding Dr. Hoffman's remarks concerning the inhuman treatment that is received by the leper thru the unwarranted fear of the laity, I wish to cite an experience of my own.

A leper escapt from his place of confinement, which was situated upon our road, and was six hundred miles away before he was apprehended. I was notified by the local authorities, where the man was held in confinement, that they wisht to return him to the home from which he escapt and was askt for instructions as to the method of transportation.

While he was being held at the town, in which he was taken from the train, he was at the mercy of a jeering mob who persisted in annoying him and throwing things thru the window of his place of confinement. The poor fellow was hardly ever left in peace, and even his attendants treated him as if he had committed some terrible crime. Before he could be removed and transported by railroad, a most elaborate arrangement had to be made with the State Medical Board of each state thru which he past, as well as procuring a private car for him with a special attendant, and for the fumigation of this car and the destroying of all bedding or anything else with which this man came in contact. After these arrangements had been completed several times, and each time the local commissioners deciding that they would and then that they would not stand for his transportation bill, the poor fellow was

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spirited away in an automobile between two days and returned to the institution from which he escapt, glad to return to close confinement for the sake of peace and quiet.

Dr. Woods Hutchinson, New York:

I am sure the Academy can do no better service than to place the seal of its approval upon the paper of Dr. Hoffman. A leper is not one-fifth as dangerous as an ordinary third-stage consumptiv. I may claim to speak with some little knowledge and a rather peculiar point of view. Most of you have acquired your knowledge of this subject. I have inherited mine. My late uncle, Sir Jonathan Hutchinson, was a student of this subject, and I have enjoyed a good deal of experience in his clinics and under his observation. One of the last cases was before a London Polyclinic. Before the patient was brought in, he explained to the physicians present that it was a private patient and he wisht no remark made or question askt which would raise any questions in the patient's mind, "Because," he said, "my patient does not know that he has leprosy, and never shall know." The disease has been pouring into London from the Colonies, and the results are the same as in the United States. In no case has the disease ever developt *de novo* in England. It is dying out in all directions. It was common on the north coast of Ireland and the west coast of Scotland in the eighteenth century. Our dread of it is an inheritance of Sunday-school days when we used to recite "Room for the leper." The movement for the leprosarium is in the interest of the leper as well as of humanity. We should guard against such small danger as may exist in a civilized community, but we should do everything we can to diminish the hysteria and panic from the exaggerated ideas of the danger of contagion. I remember one case where a leper was hounded from place to place, and was finally establisht in a little camp of his own. The neighborhood rose in mob against him, and when the medical man went to see him, they found him dead with a bullet thru his chest, and did not know whether he had shot himself or had been shot by some kind Christian. We should thoroly endorse the statement of Dr. Hoffman that we should take every possible care to protect ourselves, but the main danger is in our inhumanity and cruel treatment of the unfortunate lepers.

Mr. Jack London visited Molokai and said they were about the jolliest persons he had seen upon earth. They had come to the conclusion that while they had to die, at the same time this world was a very dangerous place and few of us ever get out of it alive. They had taken the benefit of this filosofy and made the best of it.

Dr. Hoffman, closing:

There is not much more to be said on this subject, for, as far as known, no cases of leprosy have originated in this country, otherwise than in the endemic area of Louisiana. Every case on the mainland thus far investigated

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appears to have been traceable to contact with some other case, or to personal exposure in a focus of infection in the Philippines, Hawaii, or elsewhere. Very few white persons in Hawaii have contracted the disease, and even among the Portuguese, the proportion of cases is very low. Personally, I am of the opinion that leprosy is largely conditioned by exceptionally unsanitary habits, but how the germ of the disease is conveyed from one person to another remains unknown. This much, however, we do know—that the disease occurs most frequently among nativ races living under very bad sanitary and unhygienic conditions.

The leprosy problem is an extremely interesting one and marvelously illustrates the power of human readaptation to changed conditions of life. At the Isolation Hospital in San Francisco there is a Japanese leper whose hands are frightfully mutilated, but who is an expert carpenter and a master of his craft. It would be difficult to find a better furnisht room than the one occupied by this leper, every article of furniture therein being of his own make, including a beautiful inlaid table. There is also a Chinese leper at the same institution who has developt into a first-class gardener and who has built for himself an artificial fountain with a fish-pond amidst semi-tropical floral surroundings. The idea of the garden and all of the work is his own. Similar cases of remarkable readaptation to the indescribably tragic conditions of a leper life are met with at every settlement. Much has been done for the lepers here in San Francisco, far more than is generally known. The conditions of life at the Isolation Hospital under Dr. O'Neill are in every respect satisfactory and deserving of appreciation, yet it may properly be said that the victims of leprosy have done more for themselves, considering their unhappy condition, than has been done for them—so much more, therefore, are we under the most solemn obligation to leave nothing undone that the sad condition of at least our American lepers shall be made as tolerable as possible.

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THE HOSPITAL ORGANIZATION OF RAILWAY SYSTEMS.

By C. W. HOPKINS, M.D., Chief Surgeon, Chicago and Northwestern Railway Company, Chicago.

Some years ago a distinguisht English writer precipitated almost a world-wide controversy by discussing the question "IS LIFE WORTH LIVING?" It is safe to say that the decision was in the affirmativ. To-day, if the same writer were to present the question "IS LIFE WORTH SAVING?" the vote would be in the affirmativ without discussion.

The civilized countries of the entire world are to-day working out a comprehensiv system for the effectual elimination of a great part of the immense economic loss that follows inefficient protection of their people from preventable disease, injuries and unnecessary death. In Great Britain it has been estimated and defended in debate, that thirty per cent. of the pauperism may be attributable to sickness. Holland, Austria, Bohemia and Italy, each to a lesser degree, have workt out a partial solution of this economic problem, and the United States, thru the different workmen's compensation acts, together with the great "SAFETY FIRST" movement of different industries, is doing a work of inestimable value toward the elimination of needless waste of human life and limb, which in past decades has cost the state, the municipality, the employer and the employe many millions of dollars annually, by what, to-day, is known to be preventable.

Employers of labor have devoted the keenest analysis to this subject, and the brainiest and most far seeing of them are most activ in health movements among their employes, and in the development of health departments as an important part of their great industrial organizations. Many large industrial enterprises have developt just as efficient departments of health as are to be found even in the most advanced municipalities. The per capita expenditure for health in some of these industrial groups is greater than the per capita expenditure of the average efficient municipal health department, and, further, there is this advantage,

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in that the result reaches more directly the individual who needs it.

There is no form of organization which is so wonderful or so complicated as that of the railroads, especially the American railroads, and it is because of these peculiarities that we, as medical men, have before us the greatest field for the greatest of all work —the conservation of men. *The especially qualified and practically trained employe is the greatest asset of the modern railroad manager, and it is realized that the greatest efficiency results from the best protection of the health and the activity of the experienced employe.* It is very expensiv to thoroly train a man for railroad service, and that system which will enable the well trained employe to work the greatest number of days in a given year, as well as keep him in the best state of physical efficiency, is of the highest importance.

The following quotation is from an eminent member of the medical profession, Dr. Osler, formerly of Johns Hopkins University.

> Within the past three centuries, the average working life of the English speaking men has doubled. In Shakespeare's time, the fifties were venerable; Admiral Coligny, murdered at fifty-three, is described by his contemporary biographer as a very old man. Now, when we hear of death in the sixties, we instinctively feel it an untimely cutting off in what should be a fresh and vigorous age, and, even at eighty, it seems but just fair ripeness for the sickle.
>
> The three factors which have wrought this change are: Advanced Physical Comfort, Medicine and its handmaid, Hygiene, and Surgery. And in the mitigation of the frightful mass of actual pain, of physical torment, which has racked every age down to the present, and which has scarecely been alleviated till the past century, medicine stands incomparably first.

In substantiation of his statement I will say that in the last fifteen years there have been many railroad employes retired on pension, many of whom were seventy years of age, and some still living who are less than ten years short of one hundred.

A biblical limit of three score and ten will eventually be the natural heritage of every man, and the railroads, with the assistance of the medical departments and company surgeons, are engaged in an earnest effort to bring about this condition as promptly as it is possible so to do.

The suffering and sorrow due to either sickness or accident is alone sufficient to enlist the sympathy of the most indifferent,

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but, aside from this, the expense of sickness and injury to the company and the loss of wages to the men is enormous, and if there were no other reasons, the necessity for operating the road at a minimum cost would alone be sufficient to justify the great work in science and safety tending toward the conservation of men which has been so earnestly undertaken.

The enumeration of one hundred and forty-one kinds of injuries, to say nothing of the myriad of diseases, implies an equal number of different kinds of treatment, and it is very necessary that the treatment shall be scientific and right, for it is not only immunity from suffering that the management of a railroad is striving for, but also for a minimum disability on account of sickness and injury. Thus, if a man fractures his knee, or leg, sprains his arm, dislocates his shoulder, twists his back or sustains any other kind of injury, and his recovery is dependent upon proper treatment, that is just what the management wants him to receive. For a poor job on a fractured leg, or any other maltreatment, extends the period of disability and increases the liability, to say nothing of unnecessary suffering. On a great railroad system, employing one hundred thousand men, of whom a large percentage are injured or reported sick annually, the necessity for scientific treatment is imperativ.

The idea of a large industrial organization having attacht to it a department which has to do with the medical and surgical care of the employes, is far from new, either as applied to railroads or other industries, but to anyone who will investigate this subject from its beginning, the remarkable growth and development that has taken place, especially in the last several years, as regards such a department, are truly wonderful. Not only do these departments have to do with the sick and the injured employes, but latterly that which is of far more value both to the employe and the industries has received great attention and study, namely, prevention. Prevention not only of accidents, but, what is of more importance, prevention of diseases and prevention of the more serious conditions and possible complications by the earliest recognition of a beginning disorder, and by prompt scientific and efficient treatment.

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Ours is the duty to prevent that great economic waste which inevitably results from the failure of an individual to place about himself certain safe-guards which will protect him from pernicious habits and diseases. Independently, perhaps, our profession cannot accomplish definit results in the great industrial and economic world about us, but as educators and directors of the controlling influences in this world, our assistance can become of such importance that it becomes essential in the modern industry.

In the medicine and surgery of to-day we find that this is the age of specialists, and, just as in the industrial life, organization is necessary in order to produce definit results.

One of the great problems confronting the railroads to-day is that of conservation of its employes, with the raising of the standard of efficiency. It is now a well recognized fact among the managements of the railroads that it is just as important to care for their sick and injured as it is to maintain a certain standard of efficiency or perfection of their rolling stock and road bed. The state governments, as well, are also seriously considering the importance of this fact, and are endeavoring to co-operate with the different corporations toward this end.

Certain standards must necessarily come sooner or later. Whether we have reacht this time or not it is impossible to say, but it is certainly worth while to make a trial, or perhaps I should more properly say, to commence the campaign for higher standards. Leaving aside the question of wages, which we have nothing to do with except in an argumentativ way, we come to a desired condition of the industrial worker which promises to lead to the best results. In the first place, the man should feel well and he should be free from worry and anxiety. The first consideration is proper housing, where the best sanitary conditions may be developt, and where a man can feel the environments of a home. These conditions are fundamental and it should be the province of the corporation, as it is in Europe, of the Government, to inspect the environment of the working classes, so that desirable conditions may be maintained that will contribute to the health of the workmen. Of course, in the higher class of workmen, such as men having charge of trains, such inspection would

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not be necessary because as a rule these men would be quite able to order their own environment.

Another step toward efficiency lies in the direction of physical examinations with reference to determining the approach of disease in its incipient stage, for instance: Bright's disease, diabetes, arteriosclerosis, cancer, tuberculosis, etc. These examinations should be made by men selected for their skill in physical examination and diagnosis. There should be an understanding also with the workman that this examination is not for the purpose of preparing him for the "scrap pile," but for the purpose of maintaining a condition of bodily health that will materially prolong his working days, together with a higher degree of earning capacity and efficiency.

Different railroad corporations have given this subject profound thought for many years, and much time and money has been spent in an effort to bring about the best methods to ensure the greatest welfare to the employe, and at the same time derive the greatest economic benefit for themselves.

Two general methods have been in use for some years by forty-two representativ railroads of this country, with the general predominance in favor of the hospital organization, where the men themselves contribute a certain monthly amount toward their maintenance. Twenty-four of the forty-two railroads are to-day using the hospital organization, some of which were establisht as long as fifty years ago. This was primarily brought about on account of a certain number of these roads running thru a very sparsely settled country, where settlements and doctors were few and far between, and where there were no hospitals, and where it was found that men often suffered and sometimes died because of lack of immediate and proper care. By a small contribution by the men they were enabled to receive the proper care by good men, and to enjoy the comforts that were necessary toward their well-being, and with but small cost to themselves.

The other eighteen roads employ surgeons and hospitals and treat their men for occupational injuries, paying all bills for such treatment and care without the small monthly assessment con-

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tributed by the men. There have been many arguments, by learned economists, both for and against each method.

So many questions economic, political and social, enter into the matter of how far a railroad is in duty bound to furnish surgical and medical aid to its employes, on account of the many different compensation laws of the various states thru which a railroad may run, that to arrive at any definit conclusion at this time seems to be almost an impossibility.

The benefits to be derived from a hospital organization, on account of the services rendered to the employes of the railroad by the surgical and medical forces, as well as from the standpoint of the corporation, can be considered under four general heads.

HUMANITARIAN.

It is a well-known fact that many of the diseases from which workmen suffer can be treated in their incipiency by well regulated hospital methods and by skilled men with instruments of precision that will bring about, if not a cure, a very natural prolongation of life and a period of working efficiency, for instance: in diabetes, where under favorable conditions control over patients can be maintained, the degree of tolerance can be determined. This and many other diseases, when not detected in the early stages, on account of the undermining process of the health of the individual and consequent lowered efficiency, may frequently be the cause of accidents.

When sickness or unavoidable accidents do occur, the patient is enabled to receive attention and comfort which might be impossible if he were left to his own devices.

It relieves him of a financial strain, thereby giving him mental comfort which would frequently materially shorten his period of suffering.

ECONOMIC.

It so often happens that a home environment, even of comfort, is unfavorable in a continued sickness, and the expense of a prolonged illness, where it becomes necessary to secure the services of a nurse, is so great that a typhoid fever case, for example, might absorb the surplus earnings of a year, and produce

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a degree of worry and anxiety that would lessen materially the workman's efficiency.

The question of hospital care for the employes in the case of sickness is just as important as the question of hospital care in case of injury. We have come to the time when we recognize that the saving of a part of an arm or leg may be of material value, or the saving of a partially crippled arm or leg may be of very great value to the injured workman, and this saving may only be attained under the best hospital surroundings and in the hands of the best trained men in emergency surgery.

The question of efficiency is not alone a question for the corporation and for the workman, but it is a question for the general public. The state gains whenever a sick workman can cut short his sickness and can resume his place, not only so far as he as a workman is concerned, but also his family, because sickness under any condition is more or less of a burden upon the public. It is likewise of importance to the state that the number of cripples should be reduced to the minimum.

It has been estimated by certain railroads that it costs five hundred dollars to train an employe before he becomes a thoroly safe and efficient workman and able to be trusted with the safety and lives of the traveling public. The saving of the life and limb of their trained employes naturally reduces this cost as well as prevents injury to passengers and destruction of property, on account of mistakes of the inexperienced.

Proper treatment naturally shortens disability and, therefore, works a saving by getting the efficient man back to his duties early.

It prevents the financial burden of the fellow employe which is often occasioned by neighborhood assessments on account of sickness and want caused by the financial strain brought about by long, drawn-out illness.

It serves to keep the sick employe out of the hands of unskilled doctors who make improper diagnoses and render improper treatment, thereby neglecting the illness and causing heavy financial strain by their neglect and in many cases complete failure of recovery.

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ETHICAL.

The charge of contract practice is frequently brought against the railroad service in hospital organizations. Could not this same charge be brought against some of our most profound research workers in scientific institutions or the medical man in the United States Public Health Service at Washington, or in the army or navy Service, all of whom are working for a salary, who have brought about such brilliant results at Havana, Panama, and many other tropical cities, and have made the building of the Panama Canal possible, as well as prepared the way for the commerce of the world?

What is there so peculiar in the training and work of the medical man that his services are not to be governed by the same laws of society as those of his fellow man; why should the profession of law, the ministry, architecture, engineering, and in fact all other fields of human endeavor be regulated by one ethical and social code and the medical profession by another? To my mind there is but one reason why medical men have not taken the place in that larger sphere of human activities to which they are entitled, and that is because of an apparent objection on their part to create and keep for themselves a definit field. As a working part of the great industrial world the fundamental reason for this is to my mind based upon a single cause—sentiment. Is it not true that there is hardly a physician in any of the smaller cities or towns that would not appreciate an appointment as surgeon for a railroad?

The charge has also been brought that the surgeons holding railroad positions were of an inferior class. In a canvass of one hundred presidents of county societies in Illinois, one of the questions askt was: "Do doctors in general consider the acceptance of railroad appointments ethical?" Ninety-eight per cent. replied in the affirmativ.

Another question was: "What class of doctors have railroad appointments in your community?" The replies were as follows:

Good	52 per cent.
Best	38 per cent.
All classes	10 per cent.

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Another question was: "Are they considered leaders in the community?" Replies were eighty-four per cent. in the affirmativ. Another question was: "Are they Society members?" Ninety-four per cent. replied in the affirmativ.

It would, therefore, indicate that railroads generally select the better class of surgeons and physicians in practically every community.

SOCIOLOGIC.

It is bound to have a good effect upon the morale of the men; a beneficial effect on his family and on the community. The better the man, the better the citizen, the better the citizen the better the community, and every community has its effect upon the prosperity of the state. Is it not a fact that the efficient worker who is able to bring a competent living to his family is enabled better to educate his children and to keep them out of factories at an early age where they are bound to come in contact with undesirable environments during the formation period of character, and thru neglect, remain in the more humble walks of life, all of which tend to contribute to the lowered tone of the community?

The benefits to be derived from the above may be summarized as follows:

THE STANDPOINT OF THE EMPLOYE.

First: He is protected from unethical medical men.

Second: He receives the very best attention where he otherwise might neglect himself.

Third: He is furnisht in general the very best class of surgeons.

Fourth: He has the benefit of consultation and hospital treatment where otherwise he probably would not receive such advantages.

Fifth: He is *assured* hospital treatment.

Sixth: In most cases the disability and time lost is much reduced.

THE STANDPOINT OF THE COMPANY.

First: Reports are often received which give valuable information for the benefit of the company and the employe.

Second: The surgeons and the employes are more loyal.

Third: They have more skilled surgeons than they would ordinarily have if the care of the patient was left to chance, or to the patient's selection.

Foruth: Men are gotten back to work when they are able, and there is less malingering.

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Fifth: The patient is less liable to fall into the hands of unscrupulous lawyers.

THE STANDPOINT OF THE DOCTOR.

First: The pay is sure and prompt.

Second: His position as company surgeon inevitably leads to the acquirement of private patients, both connected and unconnected with the corporation.

Third: He becomes possesst of certain transportation conveniences.

Fourth: The extension of his professional horizon carries with it increast work, enhanced skill and enlarged acquaintance.

Fifth: He has access to X-ray and research laboratories and consultations with the best medical men in the country, thereby protecting the patient and himself, thus enabling him to do better work.

In addition to the above limited discussion of the ways and means for the conservation of life and limb and the general well-being of the railroad employe, there is one other subject which is somewhat irrelevant to the above, but which I cannot refrain from touching upon briefly. It is a matter of great importance to the railroad from a humanitarian, as well as an economic standpoint, and that is the needless waste of life that takes place annually among trespassers, and for which the railroad corporation is in no way to blame.

Is it not somewhat paradoxical that two of the European countries that have been foremost in the passing of laws for the welfare of mankind as to increasing his efficiency and prolonging his life, are to-day engaged in the most ruthless sacrifice of human life?

Does it not also seem that our lawmakers who are so activ in the passage of workmen's compensation acts, with the intended benefits to mankind, are frightfully behind the times when the immense loss of human life takes place from this one cause annually? Nearly every state, county and municipality is overly activ in the passing of laws and ordinances compelling the railroads to elevate their tracks, and to adopt elaborate means of safety appliances, and at the same time they close their eyes to one of the greatest drains on humanity.

Admitting that the agitation of the subject is of comparatively recent origin, it cannot be truthfully said that our lawmakers are ignorant of the appalling facts. That they know the use

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which thousands of people make of the tracks of our railroads, and also are aware of the danger which such use involves, is demonstrated by the records of a large number of the state legislatures, which clearly show that the law making authority has been approacht repeatedly and the statistics presented. In many of the States no positiv action has been taken to remedy this evil. In the very few instances where legislation has been effected, the statute has been wholly inadequate to accomplish its desired end, as it has been enforced, if at all, in a half-hearted manner. The testimony of the agents who have sought to prosecute trespassers in the courts of law, reveals either total failure or but the slightest success. As the inevitable result of legislativ inaction, the habit of trespassing on the railroad property is growing with leaps and bounds.

We must face the amazing fact that in nine years fifty thousand trespassers on the right of way of the American railroads have met with a horrible death, and few seem to be aware of it—or, if aware, were too busy with their own affairs to pay attention to so hideous a slaughter.

Only a small percentage of this vast loss was comprised of members of the so-called tramp, or hobo class, but was made up of useful young men, women and children who were permitted to sacrifice their lives, bringing sorrow to their homes, with added great expense to the family, of perhaps limited means, and a tremendous expense to the railroads.

To the legislature of Illinois, a well intentioned and temperate, but inadequate statute has been presented, dealing with this tremendous problem. Let us hope that even this will speedily become a law and that other states will immediately fall in line, and that the railways of this country shall be freed from the opprobrium of this slaughter which is all so unnecessary, and for which they should be held blameless.

DISCUSSION.

Dr. Woods Hutchinson, New York:

I am sure we have all been greatly interested in Dr. Hopkins' paper, and I think it is of decided significance as showing the change in the spirit which is coming into modern industry. In the earlier days the attitude of the great

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employer of labor, of the great corporation, used to be to take the raw human material, grind them up, kill them, throw the scraps away and get new raw material. The welfare, the life and the interests of the working man were of comparatively small importance compared with dividends. Now, this attitude has almost entirely reversed itself. It has been found, for instance, that it costs in the neighborhood of five hundred dollars to make a man a safe and efficient member of a railroad force. The same thing has been found in other institutions employing labor. The longer the individual can be trusted, protected and continued in improvement and in training, the better for the corporation, the better for the individual, and the better for the general public. The public, I know, is not aware of the immense debt of gratitude which they owe to both the railroad men themselves and the men employed as managers, surgeons, etc., of the railroad company.

Another point is that I believe the railroads and some of the other employers of labor have foreshadowed the really sensible relation between the doctor and his patients, that is to say, in a yearly payment, prorating the amount of sickness in the community. The mortality and morbidity rates should be taken as a basis, and the annual fees arranged to cover all emergencies. In that way an attack of typhoid will not be an absolutely disrupting and bankrupting influence in the life and home of a laborer. I am sure that the valuable and interesting systems adopted by the railroad companies are going to be a model upon which arrangements of that sort will be made in ordinary medical practice. We have got to get over the absurd prejudice against contract practice. There is no objection to contract practice if it pays well. It is only that contract practice which does not pay that is undesirable and unethical and all that kind of thing.

Dr. R. W. Corwin, Pueblo, Colo.:

I have been much interested in this paper. I know the good work Dr. Hopkins has been doing and congratulate him on the excellent results obtained under his management.

For thirty-five years I have been chief surgeon for the Colorado Fuel and Iron Company, and during that time, local surgeon for a number of railroad companies. The Colorado Fuel and Iron Company medically and surgically cares for the families of the employes, as well as the employes. It built and conducts its hospital. This, I feel, is better then to employ a general hospital, because the surgeon can control the management of the hospital and conduct the care of patients better than it is possible to do in a general hospital.

In a general hospital it is impossible to have your orders observed as in one under your control. You cannot overcome noises, especially if made by doctors, visiting nurses or members of the board of management. Smoking, offensiv medicines and many other annoyances cannot be prohibited in the general hospital, all of which have much to do toward the comfort and even recovery of the patient. For instance, in our hospital we permit no loud

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talking, laughing, heavy walking or swishing of skirts from stiff starching, no smoking, and no iodoform. The floors are covered with cork carpet so as to overcome noise from walking. The doors swing thru and close noiselessly. Curtains are arranged so that there is no rattling. They can be taken down and laundered. We have no elevators or stairways. Inclines take their place. The persons weak, old, lame, short or tall, may take steps most suited to their convenience. All of these are conveniences and necessities which aid in a patient's recovery, and can be controlled in a private hospital and not in a public one.

Dr. A. Miles Taylor, San Francisco:

It certainly has been a pleasure to me to listen to Dr. Hopkins' paper. Having spent a quarter of a century of my life as a railroad surgeon, I feel more interested than I would otherwise. The doctor seems to have covered everything that can be said along these lines in the way of advancement in the care of the employes and the passengers injured on the railroad, the sanitary conditions, the benefits to the family, etc. However, I will say that here in California it is the duty of all the surgeons of the railroad company to make inspection frequently of the shops, cars, water supplies, the environment of the employes, and the houses their families live in. Since this system has been inaugurated, sickness has been reduced fifty per cent. in the last ten years.

The doctor speaks also of the well-trained man in the service of the company, which is one of the greatest assets a corporation can have. Train accidents are prevented when the trainmen know every curve, bridge, boggy place, where to look for slides, etc. If we have an untrained man trying to make up lost time, the result may be an accident which may cause a great deal of worry and trouble to the officials, loss of life and limb to the passengers and employes, financial loss to the company, and many other things that are deplorable. All this might be prevented if the company were able to keep trained men in the service, as the doctor has so eloquently stated.

If the employes have health and their minds are not disturbed, they can do better and more efficient work; but, if their families are ill, the children out of school on account of financial or other troubles, they are not in position to give the service to the company, or to the public who patronize the company. It behooves the physician and surgeon of the railroad companies and other industries to see to the health of the families as well as the employes. This can only be done by securing the best sanitary surroundings. It has been my rule, for the past fifteen years, to select the health officer of each county to act as surgeon for the railroad company. In doing so, he has a double duty; he must look after the sanitary conditions as well as the health of the employes. In employing such men we select the best we can get; and, in case of accident or illness, the best is the cheapest, the results are better, and the sooner we can get the men back to work the better it is for all concerned. It is said that railroad surgeons and industrial surgeons in the

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factories are employed because they can be had at small salaries. That is not true thruout the Western States. In place of the surgeon seeking the position, the company, or the chief surgeon in charge, tries to select the best surgeon procurable; thereby, the position seeking the man.

In regard to the hospital. We have patients who are injured or taken sick given the same service as the millionaire stockholder or the richest passenger injured on the road. There was a time when the passengers received first attention and the employes came last. That time is past. The poor section worker is lookt after to-day just the same as the richest passenger. We have our ambulance service in every city along our line that is large enough to maintain one. They are given instructions to give their best and quickest service. We select the best hospitals for our employes and passengers alike, and we pay the same for each of them. I believe, as Dr. Corwin said, the private hospital is best where you have full control. To-day we have public hospitals under excellent management, the equipment the best capital can produce. The same results and equipment do not always exist in private hospitals. If we demand it, we get absolutely first-class service. We had a private hospital before the earthquake, but since then we have had about as good results in the public hospitals.

Speaking about the malingerer: Dr. Hopkins said he had not had many. I have found that since we have had so much legislation and so many laws past bearing upon the laborer's compensation in cases of injury—the physicians themselves are to blame for some of the laws past because they left it entirely in the hands of the politicians—the malingerers have increast. You dismiss them from the hospital, and the next thing you are called before the "Industrial Accident Commission" to defend your action, as they have gone to some other physician who reports many things wrong. After the trouble the board has been to, the trouble it caused the surgeons, and the inconvenience to all concerned, almost in every instance you simply find him as he was when dismist from the hospital—a malingerer. We have more cases of this kind than before the Workmen's Compensation Act was past. They try to play upon the good graces of the board, who they think do not understand the condition and have not the power and privilege of calling in experts and physicians to assist them in their investigation.

Dr. C. W. Hopkins, closing:

Referring to Dr. Hutchinson's remarks regarding contract practice; there are times when it becomes rather amusing, especially regarding railroad work.

There have been occasions when railroad local surgeons have been brought before the county society charged with doing contract practice. In several instances, where the local surgeon had died or resigned, the man who started the agitation and who was the cause of the local surgeon being brought before the county society, was the first man to send in an application by wire for this man's position. The matter of contract practice seemed to look differently to him when there was a chance of gaining the position for himself.

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A short time ago one of our local surgeons was operated upon for appendicitis and died under the anesthetic. He had recently been called before the county society, charged with doing contract practice. I received a wire the very next morning from another surgeon in that town, asking for the position, and learned later that he was the man who had been instrumental in bringing the charges. I decided that the new applicant had the telegram ready to send before the anesthetic was started upon the unfortunate doctor. It is needless to say this gentleman did not receive the appointment.

Regarding Dr. Corwin's remarks with respect to hospitals, I wish to say that of all the hospitals I have ever visited over the country, municipal, private, or owned by corporations, I believe he can be considered the pioneer in establishing what may be called a perfect hospital. I have never been in a more absolutely perfect hospital than the one in Pueblo, owned by the Colorado Fuel and Iron Company, and under the charge of Dr. Corwin. Everything has been done for the comfort of the patient, for good work by the surgeons, plus the most pleasant surroundings, both inside and outside of the building. The doctor has gone so far as to remove all the bath tubs, because he thought a man should wash his head first and his feet last, and for fear that some one would get in the tub feet first, everything for bathing purposes was made into shower baths.

The inclines do away with noisy elevators and stairs and save a great deal of time in doing away with the lazy elevator boy, who is probably asleep at the top floor.

I feel that no one is better qualified to speak along the line of hospitals, their equipment and efficiency, than Dr. Corwin.

Regarding the malingerer, I was much interested in the remarks by Dr. Taylor. There is no one that is such a thorn in the side of the railroad surgeon, or who gives the railroad so much trouble as this type of individual.

There was one rather amusing case with which I had to deal about a year ago. A car repairer was contused somewhat over the shoulder by a car wheel while sitting astride the rail under a car. For months this man went around claiming that he could not move his shoulder, could not dress himself or even feed himself with his left hand. He would not allow you to manipulate this shoulder or carry the arm in any direction. Nevertheless, under anesthesia he would use the left arm and shoulder in any and every direction while going thru the period of excitement, and I was able to handle this shoulder and place it in any position while he was anesthetised. These examinations under anesthesia were made repeatedly, always with the same result. At the same time all electrical tests were normal. This condition of affairs lasted about six months. In spite of the fact that this man was lookt upon as a malingerer, the road gave him the benefit of the doubt and settled with him for the sake of closing the case.

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Three days after settlement was made, the local surgeon met him on the street and askt him how he was. He stated that he was "fine." Could use the arm in any direction and gave the doctor an exhibition of his fully recovered motion at the shoulder. Upon being askt what he had done to bring about this early and complete recovery, he stated that he had been to a little town nearby and the village blacksmith there had found a dislocation and had reduced it, and since that time he had been perfectly well. This was in spite of the fact that we had at our disposal all the appliances for diagnosis, such as the X-ray, anesthesia, electrical tests, etc. I have about decided to place this village blacksmith upon our staff to diagnose and correct conditions where we surgeons fail.

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THE TRANSMISSION OF TYPHOID FEVER ON TRAINS AND STEAMBOATS.

By Assistant Surgeon-General W. C. Rucker, M.D., M.S., Gr.P.H., United States Public Health Service, Washington, D. C.

The epidemiology of typhoid fever has past from the realm of speculation into that of fact. The elemental factor in the spread and continuance of typhoid fever is the promiscuous dissemination of human feces. Whatever human excrement is carelessly disposed of there typhoid fever will be, and wherever persons or communities are either careless or ignorant, this condition will obtain. In the strict sense of the word, therefore, typhoid is not a place disease, unless the term be used to designate that place in which there is careless disposition of human filth. The disease is not confined to any one section, nor to any one season, and whoever travels to any very great extent is sooner or later going to meet the *B. typhosus*, in a viable state. Those who stay at home may be living under sanitary conditions, at any rate they are exposed to a set of conditions to which they are more or less habituated, but the moment one begins to travel he multiplies his contact with the source of infection. Not only is the source of food and water supply constantly being changed because the traveler passes from supply to supply but also there is an increast opportunity to come in contact with chronic typhoid bacillus carriers, because with each change in the source of food and water supply there is also a change in the personnel of those handling such food and water supplies. Thus, in addition to the ordinary factors to which the stay-at-home is exposed, the traveler runs the risk of the cook or the waiter in the dining car, the steamboat, the hotel and the restaurant, and he also has the added risk of the news-butcher who may himself be a chronic typhoid carrier, at any rate whose food products are very apt to have been handled by passengers some of whom may be typhoid bacillus carriers.

It must be admitted, however, that the health of the traveling public is fairly well safeguarded on railway trains. In the first place, the journey is for the most part short. Of the millions

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of passengers carried on American railways each year, the great bulk of them only travel for a few hours, and usually under quite as good sanitary conditions as they have at home. The United States Public Health Service has taken adequate measures for requiring pure drinking water for passengers. The Interstate Quarantine Regulations require that the purity of water served to passengers in interstate traffic shall be certified by the Interstate Sanitary Officer or the state or local health authority within whose jurisdiction the water is obtained, and it is required that this water shall meet the standard which was prepared by the Commission of experts appointed by the Secretary of the Treasury for that purpose. This standard is much higher than that required by most municipalities. The Interstate Quarantine Regulations, which have recently been redrafted and which are soon to be promulgated by the Secretary of the Treasury,[1] require that persons, firms, or corporations, engaging in the business of furnishing food and drink for the use of passengers traveling in interstate traffic shall not supply any article of food or drink unless the same shall have been obtained from a source known to be free from the contagion or infection of disease, unless the same shall have been sterilized, pasteurized, or otherwise treated in such manner as to insure that the article is free from the danger of conveying contagion or infection, and that all articles of food or drink for said passengers shall be so handled and stored as to prevent contamination with contagion or infection. In addition it is required that the bedding used by such passengers shall not have been used by any other person since last laundered, that common towels and drinking cups be not used, and that persons having typhoid fever shall not travel except under certain restrictions.

With regard to travel by ships, it cannot be said that the danger is so small. Several outbreaks of typhoid fever have occurred among passengers on steamboats on the Great Lakes, and the studies of these outbreaks have demonstrated very clearly that the infection was received by the passengers while on board these vessels. The infection in such instances is usually received thru

[1] The revised Interstate Quarantine Regulations were promulgated by the Secretary of the Treasury on January 15, 1916.

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polluted water, and this pollution may occur in one of several ways. In a number of vessels inspected it has been found that the water was taken directly from the lake over which the vessel was sailing. In this way polluted water may be taken by injudicious choice of the place at which water is pumpt into the vessel, *i. e.*, by taking water which has been polluted by the sewage from cities and towns. In other cases it has been found that the water intake of the vessel and the sewage discharge pipes of the vessel are so arranged that it is very easy to pump the sewage which the vessel is discharging into the water tanks. It is easy to see how under such circumstances a single acute or chronic typhoid bacillus carrier might infect the water supply of the vessel. The Interstate Quarantine Regulations above referred to prohibit taking water from the lake or stream over which the vessel is sailing unless the water is sufficiently purified before serving to passengers. Several vessels have already equipt themselves with plants for accomplishing such sterilization, and it is believed that in this way much of the steamboat typhoid will be prevented.

Trains and steamboats may not only be the means by which passengers acquire typhoid fever, but they may also be the means of spreading the disease to persons who are not travelers. The careless transportation of an acute or chronic typhoid bacillus carrier may cause the pollution of water courses by the discharge of the sewage of trains and boats directly into them. It is believed, however, that the dangers from track pollution have been very greatly magnified, and that the amount of excrement which is thrown directly into water courses from trains is inconsiderable in comparison to the other sources of pollution to which water courses are liable. On the Great Lakes the discharge of sewage from steamboats in the vicinity of water intakes undoubtedly plays a considerable role in the spread and perpetuation of the disease. This may be, and is in part being, controlled by the use of holding devices which will retain the sewage on board the ship until it can be discharged at a safe place. Trains and steamboats also act as distributors of typhoid fever by reason of the fact that they permit the distribution of persons who are acute or chronic typhoid bacillus excreters. For example, prior to

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the Civil War typhoid fever was largely an urban disease, but when the armies were disbanded and the many typhoid carriers which they contained returned to their respectiv homes, the disease was planted in rural communities thruout the country, from which it has not yet been eradicated because of the continuance of the faulty methods of excrement disposal.

The proper control of typhoid fever on trains and steamboats means, primarily, the generalized control of typhoid fever. To be sure if there were some way by which chronic carriers could be cured, a great forward step would have been taken toward the eradication of the disease. We are not yet in possession of knowledge as to the means of accomplishing this. Therefore, the problem is very largely one of excrement disposal. The mandatory physical and bacteriologic examination of all persons engaged in handling food and water for passengers will accomplish much, and the legal regulation of food and water supplies for passengers on trains and steamboats will also assist very materially in the solution of the problem. The great and lasting result which is to be sought is the inculcation of the teachings of personal hygiene into the public mind. This has as its foundation the teaching of hygiene during the period of life when the mind is receptiv and pliable and before unhygienic habits have been formed. It is true that a certain amount of good can be accomplisht by the instruction of the adult layman, but the public health propaganda which is now being actively pusht by Federal, state, and municipal governments, cannot hope to achieve full results until the present generation of little children have become men and women. The Public Health Service, in co-operation with the state and local health authorities, is carrying on typhoid eradicativ work in a number of rural communities thruout the country. The object of this campaign is the teaching of the proper methods of excrement disposal, and in each of the places in which this work has been carried on there has been an enormous reduction in the typhoid morbidity rate. As this work progresses, and the sanitary privy comes into more general use, there will be a further decrease in typhoid, and, therefore, a further diminution in the danger of its transmission on trains and steamboats.

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THE TRANSPORTATION OF CONSUMPTIVES.

By HENRY BIXBY HEMENWAY, A.M., M.D., Evanston, Illinois.

From the nature of the case, consumptives are natural travelers. Patients suffering with acute diseases seldom attempt journeys, and if suffering with acute infectious disease, they are forcibly detained by governmental authority whenever they show a disposition to go from one place to another. With consumptives, however, conditions are very different. The disease is generally of long duration, and a change of location is very frequently sought for its curativ influence. While such a journey as from the region of Chicago to New Mexico or Arizona, or to the mountains of North Carolina, or from New York City to Saranac may not be necessary, yet it is a matter of common knowledge that certain areas are particularly advantageous for the cure of the disease, and it is becoming further recognized that the educational value of coming for a time under the discipline of tuberculosis colonies with expert management is of great assistance in overcoming the disease. It, therefore, happens that consumptives are especially prone to take long journeys upon public means of conveyance. It must be remembered that they are more likely to make these journeys during the earlier stages of the disease, when the number of disease germs escaping from them are very few. When lung tissue is breaking down, when their sputum is loaded with bacteria, they are less likely to attempt the fatiguing journey; and then their hectic flush is a flag of danger to others, and their cough is like the fog-horn, warning other travelers of possible peril.

Humanitarianism, as well as law, would protect consumptive patients in their desire to travel unless it is shown that such journeyings would particularly endanger fellow travelers. All governmental efforts at the restraint of disease must be based upon the doctrine of probabilities.[1] The governmental authority of such regulation is found in police power,[2] and diseases to be restrained are regarded as nuisances.[3] Efforts at govern-

[1] "Public Health," 27, 31. (To avoid too great length, the author craves permission to refer to sections of his work upon the "Legal Principles of Public Health Administration.")

[2] "Public Health," 105.

[3] "Public Health," 12, 106, Chap. VIII.

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mental restriction of disease in the United States are only sustained by the courts when their reasonableness is evident.[1] The nuisance must be real, not fancied, and its existence is a question of fact, not of theory or notion.[2] Before attempting to prevent, or to regulate such migration, it becomes necessary to demonstrate that it is, or may naturally be, attended with danger to the health of others, and that this danger is sufficiently great to warrant special provisions.

What evidence is there to substantiate the suspicion that the traveling of consumptives endangers fellow passengers?

It must be remembered that according to our present information it is probable that most cases of tubercular infection occur during childhood. After a person has reacht the age of manhood he has ordinarily acquired a degree of immunity. A disproportionate number of travelers are adults. Children are very likely to be left at home. This reduces the possible danger.

Secondly, travelers are less likely to die of consumption than those who stay at home. This is shown by a study of the mortality statistics. The following data are taken from the United States Mortality Reports for the decade ending 1909, and refer to deaths of men above 19 years of age within the registration territory, from which we have computed the percentage of deaths from consumption, as compared with the total deaths in the occupations named:

RELATION OF DEATHS FROM CONSUMPTION TO TOTAL NUMBER.

Occupations	Total deaths.	Consumption.	Per cent. consumption.
All occupations	204,975	29,821	14.5
Steam railroad employees	5,368	386	7.2
Boatmen	1,706	179	10.5
Commercial travelers	540	54	10.0
Lawyers	1,325	99	7.5
Physicians	1,421	94	6.6
Street car employees	682	128	18.8
Bookkeepers	1,702	372	21.8
Clerks	6,772	1,908	28.2
Salesmen	2,513	398	15.8
Food manufacturers	3,140	505	16.0

[1] "Public Health," 14, 31, 170.
[2] "Public Health," 201.

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Lawyers and physicians, while not regular travelers, still represent the traveling public. It must be remembered that the term "salesman" is frequently used with reference to commercial travelers, and that may explain the difference between the figures for salesmen and clerks. Under the heading "Food manufacturers," we give the figures for bakers, butchers, butter and cheese makers, confectioners, millers, and "other food preparers." Since the consumptive rate for these food manufacturers is above the average, while that for traveling people is decidedly below that average, it appears from the government figures that food manufacturing industries demand the attention of the phthisiphobiacs more than transportation companies.

Thirdly, if there were special danger to the traveling public from this cause, we should find passenger brakemen and conductors showing a higher consumptive rate than similar employees on freight trains, especially since the passenger men have generally served their time on freights. The reverse is the case. The only figures that the writer has been able to secure on this subject are those publisht by Dr. Charles B. Dudley, of the Pennsylvania Railway, in the *Railway Age*, Oct. 13, 1905, representing eighteen years' experience:

AVERAGE TUBERCULOSIS PER 100,000 EMPLOYED, PENNSYLVANIA RAILROAD COMPANY.

	General.	Passenger.	Freight.
Disability	230		
Conductors		330	400
Brakemen		120	170
Deaths	90		
Conductors		77	100
Brakemen		52	67

Fourthly, the mere presence of tuberculous persons does not necessarily add a perceptible danger, as judged from the mortality and morbidity reports of the south-west. According to the investigation of Sweet,[1] during the ten years ending 1913, the number of interstate migrants in the three cities, Albuquerque, El Paso and San Antonio, averaged 7,883 per annum. Many

[1] Public Health Reports, Vol. 30, p. 1071.

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of these migrants are in advanced stages, and it is not uncommon for them to die on the train. During the same ten years it was found that of the total number of deaths from consumption, a large proportion had been at place of death less than six months, as shown by the following table:

DEATHS FROM CONSUMPTION, PERCENTAGE RESIDENCE AT CITY.

City.	Per cent. died within 30 days.	Per cent. 30 days to 6 months.
Albuquerque	15.6	30.9
El Paso	11.5	19.0
San Antonio	32.7	7.1

As the result of this careful study of the subject, Sweet says:[1] "So far, then, as affecting the health of communities is concerned, this influx of consumptives has had no appreciable effect, and there is not the slightest evidence to show that the hazards of residence in the resort towns studied are a whit greater than in any other community." Surgeon Foster, also in the Public Health Service, made his investigations in North and South Carolina, and his conclusions are:[2] "The danger of infection to other travelers and to employees of common carriers, while present in a limited degree, is not very great."

Finally, the most careful tests of the dust from carpets from cars, many of which were known to have carried consumptives, of the upholstery, curtains, bedding, woodwork and air of the passenger cars, failed to find tubercle bacilli except in one instance out of 195 trials.[3]

The following data are taken from the recent report of Surgeon Carrington, in the Public Health Reports, March 19, 1915: Dr. John C. King, of Banning, California, had said: "Tuberculosis is ubiquitous, therefore, railroad employees suffer from it. The percentage of morbidity is probably less among them than among any other large mass of employees, except those in the Army and Navy. * * * In attempting to group the men we find that engineers and firemen are quite exempt from the disease.

[1] *Loc. cit.*, p. 1236.
[2] Public Health Reports, Vol. 30, p. 773.
[3] Kinyoun, in *Medical News*, July 29, 1905.

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On the other hand, Pullman conductors furnish a large quota." It will be noticed that no exact data are here recorded. Dr. Iseman, of Los Angeles, found that out of a list of 178 cases in his practice there were only seven railway employees, and not one of these is in a class coming in contact with the traveling public. The Pullman Company, and most of the railway companies, have no data on the subject. Carrington, in the course of his investigations, found only one Pullman conductor suffering from tuberculosis. The Santa Fe Railway Company report that the trainmen on passenger trains show little consumption. Their statistics, however, do not accurately divide passenger and freight trainmen. They find little tuberculosis outside of the office force.

CONSUMPTION AMONG EMPLOYEES OF THE SANTA FE COMPANY.

	No. in service.	Tubercular.	Per cent. tubercular.
Conductors	383	1	0.26
Brakemen	584	18	3.08
All employees	14,687	153	1.08

It does not appear why the figures for the Santa Fe as to the relative amount of consumption among conductors and brakemen should be the reverse of those for the Pennsylvania road. If, however, there were a special danger from riding in cars transporting consumptives, we should expect an increast amount of the disease among trainmen. This is contrary to experience.

Granting that there is some danger of infection, just as there is in every church, theatre, lecture room, or other place where people come together, in which cars is the danger greatest? Sweet found that 50 per cent. of the tuberculous persons were in the day coaches, 30 per cent. in tourist sleepers, and 20 per cent. were in standard Pullmans.

Perhaps the same figures would represent the total number of persons in each style of car, from which we may see that each individual would have at least two and a half times as much cubic air in the standard Pullman as in the day coach; and the relativ cleanliness of the passengers is according to much the same scale. Day coach travelers are much more likely to throw

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fruit skins upon the floor, or to expectorate in the car. Again the greatest number of passengers in a particular car, the greater will be the chance that the car may contain a tubercular patient. From all these considerations, we must conclude that the danger of infection is greater in the day coaches, which often make short runs, perhaps within a single state.

Danger of infection is proportional to the amount of infectious material, other things being equal. The natural protectiv influences of the body may easily overcome a few bacteria, while they may be incompetent to cope with a larger number. If a person be struggling with the infection within himself, and then be exposed to external infection of a like kind, the second source may turn the tide against him. Any attempts at segregation of consumptives during transportation seems, therefore, to be in violation of our scientific knowledge, as well as being difficult of practical enforcement.

The subject now for consideration is only the legal problems connected with the transportation of consumptives. It is true that many consumptives seeking climatic aid become financial burdens upon their new home government; but this is essentially a problem of dependency not of tuberculosis. In self defense it might be permissible for the state, or municipality, to insist upon immigrants having visible means of support before admitting them. The fact that they may have tuberculosis may be an evidence that they will not be able to support themselves, and therefore evidence of possible dependency.

There is everywhere the problem of the care of tuberculosis. In the present discussion, however, the general care need not take up our time—we have only to do with those problems which arise by virtue of the fact of the traveling of patients.

We must remember, also, that attempts at forcing the restriction of consumptives by the railroads, as by the use of hospital cars, presuppose that the employees of the roads will act as police, detecting and detaining all consumptive passengers. This presupposes also a technical education, and an ability to make correct diagnosis which is practically impossible. It must be remembered that should a non-tuberculous passenger

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be thus classified with the sick, he might have good grounds for collecting damages from the road. Further, very frequently the consumptive does not buy his own ticket, and the first employee or servant of the road to have notice of the intention of the consumptive to take the trip would be the brakeman who helps the passenger on to the train. Attempts to thus require segregation are therefore impractical of performance and could not be impartially administered. This impracticability and partiality would render such orders illegal.

Public carriers cannot, without good cause, refuse to carry the passengers asking for transportation; that is, they cannot sell tickets to some and refuse to sell to others.[1] If refused without just cause a passenger may recover damages.[2] The damages awarded may include something for the indignity, vexation and disgrace to which he has been subjected.[3] However, persons may be excluded if their presence in the vehicles would endanger the lives, health, or peace of other passengers, as on account of intoxication.[4] Under the same general principles a passenger may be excluded on account of his having a contagious disease such as smallpox, but he may not be ejected at a place where he cannot find accommodations.[5] Not only may such passengers be refused transportation in the ordinary cars or boats, but it may be a duty of the road to its other passengers to make such exclusion, taking care that the person so excluded is protected from unnecessary discomfort.[6] If the employees of the road fail to make such exclusion, and in consequence another passenger contracts the disease, as of measles, the road is liable for the damage resulting. But it cannot be held thus liable if the employees of the road were not cognizant of the presence of the infecting patient.[7]

[1] Indianapolis, etc., R. R. Co. v. Rinard, 46 Ind. 293; State v. Delaware, etc., Ry. Co. 48 N. J. L. 55, 2 Atl. 803, 57 Am. R. 543.

[2] Wallen v. McHenry, 3 Humph. (Tenn.) 244.

[3] Chicago, etc., R. Co. v. Williams, 55 Ill. 185; Nevin v. Pullman P. C. Co. 106 Ill. 222.

[4] Pittsburg, etc., R. Co. v. Vandyne, 57 Ind. 576; Freedon v. N. Y. Cent. R. Co. 125 N. Y. App. Div. 306, 48 N. Y. Supp. 584; Stevenson v. West Seattle Land Co. 22 Wash. 84; Brown v. Memphis, etc., R. Co. 7 Fed. 51.

[5] Paddock v. Atchison, etc., Ry. Co. 37 Fed. 841, 4 L. R. A. 231.

[6] Bogard's Administrator v. Illinois Central Ry. Co. (Ky.) 139 S. W. 855.

[7] Bogard's Administrator v. I. C. Ry. Co. 139 S. W. 855.

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As we have seen, there is not enuf evidence to show that consumption is necessarily sufficiently dangerous to the health of other passengers to warrant exclusion on that ground. It is a question of fact, not of theory or of feeling, and the evidence is against the supposition of danger. But it is not necessary that the danger be for other passengers. One seriously ill may need extra medical attention, and this may be a much more serious problem on the water than on land, on account of the lack of hospital facilities. The common carrier is bound to take as passengers all who offer themselves, sick or well, provided the carrier can furnish the necessary accommodations and the patient is willing and able to pay for what he demands. But where a person who is ill presents herself to a common carrier for transportation by water it is her duty to state the fact that she is ill, and make special arrangements for her transportation as a person in need of special attention.[1] The case just mentioned was one in which the ticket was bought by some other person than the patient, and after she had been brought on board the ship the ship surgeon ordered her removal. A similar ruling might sometimes be justifiable relativ to railroad transportation.

If a passenger be suffering from some disease known to a servant of the company, it is demanded that greater care be given than for an ordinary passenger. The road is not bound to accept such passengers needing extra care,[2] as for a patient sick, and unattended, but unable to care for himself; but having accepted him as a passenger the corporation is bound to give him the necessary extra care.[3] This special care and attention does not mean that the road must run hospital cars; nor that it must permit passengers to be placed in the baggage cars, on cots. "If it accepts a sick passenger, its duty is to place him in a passenger car in such a position as will insure, as far as possible, his safety and his comfort. Where the carrier does this, the measure of his duty has been fulfilled."[4] While it is customary for steam-

[1] Connors v. Cunard Steamship Co. 204 Mass. 310, 90 N. E. 601.
[2] Denver & R. G. R. Co. v. Derry, 47 Col. 584, 108 Pac. 172.
[3] Croom v. Chicago, etc., R. Co. 52 Minn. 296, 53 N.W. 1128, 38 Am. St. R. 557, 18 L. R. A. 602.
[4] Central of Georgia R. Co. v. Fleming, 79 S. E. 369 (Ga.).

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ship companies upon the ocean to furnish the services of a physician and surgeon, it is not at all sure that there is any obligation to give this service without special arrangement, and having furnisht a physician the company does not render itself liable for errors in treatment if the physician be reasonably competent; and the burden of proof as to incompetence rests on the passenger so claiming.[1]

The duty of the road to its patrons is really covered by the expression "A common carrier of passengers is under duty to exercise the highest degree of care not to expose the passenger to any danger which human care and foresight might reasonably anticipate and guard against.[2]

If it be admitted that some governmental control should be exercised relativ to the transportation, the question arises, By whom may such power be exercised, and to what extent?

Before the adoption of the national Constitution the restrictions placed upon commerce among the different states greatly inconvenienced the people. This was one of the prime causes of the movement for a new arrangement,[3] and in consequence we find in the Constitution[4] power given to Congress "To regulate commerce with foreign nations, and among the several states, and with the Indian tribes." Persons as well as merchandise are included under the term "commerce," and are therefore under congressional control.[5] An interstate journey, or commerce, is one in which portions are in different states; it may begin and end in the same state, but if in any portion of the trip it passes outside of that state it immediately becomes interstate.[6] This congressional control includes the means of transportation.[7] Thus a Louisiana statute requiring separate accommodations for whites and blacks was held not to apply to steamers on the Mississippi River, tho the passengers were simply going from one point in the state to another.[8]

[1] Easler v. Columbia R. G. & Elec. Co. (S. C.) 84 S. E. 417.
[2] Weber v. Chicago, R. I. & P. Ry. Co. (Iowa) 151 N. W. 852.
[3] Metropolitan Bank v. Van Dyck, 13 Smith (N. Y.) 508.
[4] Art. I, Sec. 8, Par. 3.
[5] Passenger Cases, 7 Howard, 283; Hemenway, Public Health, 233, 236.
[6] Hemenway, Public Health, 238 and 242, citing cases.
[7] Public Health, 242.
[8] Hall v. DuCuir, 95 U. S. 485.

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Judging from the decisions as to merchandise, we may say that a person is under the operation of the commerce clause of the Constitution from the time he is bookt for a journey until he becomes a citizen of the new state. Under this clause an alien was ordered deported from the country when it was found that she had entered a house of ill-fame, tho she had married a citizen of this country, and thus herself had become an American citizen.[1] While, therefore, under the general police powers, the state may make such reasonable regulations upon the transportation of persons as may seem advisable, those regulations must not interfere with interstate commerce. How far-reaching this restriction is may be seen from a North Carolina case, in which it was held that an ordinance requiring a local license for solicitors of orders was an interference with interstate commerce when the solicitor was seeking orders for goods to be shipt from another state.[2] In other words, local regulations may be made on the intrastate transportation, but it must not interfere with interstate traffic.

It often happens that policy dictates the non-use of force. There is nothing in the nature of tuberculosis which would justify severe quarantine restriction. While it is proper for communities to demand that immigrants show visible means of support, experience would not justify any attempt at preventing tuberculosis persons from acquiring residence simply because they were tuberculous. On the other hand, a person who spits upon a car floor commits a nuisance, and is himself a nuisance. The fact that a man is taking an interstate trip does not entitle him to commit murder, to steal, nor to break other state laws. Even without special statute the spitting upon the floor of cars might be considered a common law nuisance, and no one has a right to commit a nuisance. By state enactment the common drinking cup has been generally abolisht, and many states prohibit spitting upon floors of cars or depots, or on platforms. Such rules are not restrictiv of interstate commerce, and are entirely proper. They add no special

[1] Low Wah Suey *v.* Backus, 225 U. S. 460. Also, Bugajewitz *v.* Adams, 228 U. S. 460.
[2] Caldwell *v.* North Carolina, 187 U. S. 622.

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burden either upon the transportation company or the passenger. In addition to such regulations, state officers might very properly co-operate with railroad companies in furnishing information as to precautions to be observed by tuberculous persons at all times.

Since cars or boats may at any time be used in interstate traffic, their sanitary supervision devolves chiefly and supremely upon the national government, and that supervision is being exercised by the Public Health Service of the Treasury Department. This Service is intelligently studying the problems involved from a scientific standpoint, and under its direction cars are cleaned and fumigated. Because this Service is doing efficient work there is little excuse for state governments to attempt to deal with the problems. No law should ever be past unless it is to be impartially enforced, for laws unenforced beget contempt of all law. To leave the regulation of the care of cars to different states has caused confusion in the past. Adjacent states have sometimes made antagonistic regulations. This causes confusion and hardship. It is advisable therefore that states should keep "hands off." Under the care of the national government, regulations are uniform. The transportation companies are at present willingly co-operating with this Service, and will doubtless continue so to do. Under such conditions enactments are not necessary or advisable, for enactments have a lack of flexibility needed to easily keep up with scientific advances.

Journeys are tiring and exhausting. The effect upon consumptives in advanced stages may be fatal, and even those slightly ill show increase of disease. After such a trip a consumptive patient should always be kept in bed for a few days, and during the journey strength should be saved as much as possible.

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THE DISEASE CARRIER ON TRAIN AND STEAMBOAT.

By WILBUR A. SAWYER, M.D., Director of the Hygienic Laboratory of the California State Board of Health, Berkeley.

The traveler runs a greater risk of contracting disease than does the man who stays at home. He enters a large number of communities with varied climates, and is apt to come into contact with acute cases of contagious disease, with chronic disease-carriers, and with disease-bearing insects. In this way he is likely to be exposed to diseases against which he has acquired no specific immunity, as he has had no experience with them at home.

Infections taking place on trains and steamboats, while secondary in number to infections in the communities visited, are nevertheless deserving of special consideration. A part of these infections are traceable to disease-carriers—persons who are healthy but nevertheless harbor and discharge germs capable of producing disease.

In certain respects the disease-carriers on railroads and steamboats are more dangerous than if they were not traveling, altho this increase in danger is to a degree offset by sanitary supervision usually exceeding that exercised by health officers at the carriers' homes. The carriers, when traveling, come into contact, often under conditions of crowding, with people going to many localities. The persons infected by such carriers introduce the disease into their widely separated communities. Moreover the carrier who is traveling is less likely to be discovered and controlled than the one who stays at home, because his victims are widely scattered and have little notion as to the source of their infection. Attention is not called to him by recurring cases of the disease in his neighborhood.

The diphtheria carrier is our best known representativ of those carriers who distribute infectious germs in the secretions of their noses and mouths. On both trains and ships the limited space increases contact between passengers. Necessarily, the passengers, one after another, in rapid succession, handle fixtures, such

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as doorknobs and hand-rails, and thus make opportunity for the transfer of infection from hand to hand and then to mouth. They often cough and sneeze in close proximity to each other. Before the common cup was abolisht on interstate carriers, it furnisht an almost direct method for the transfer of diphtheria, common colds, and the like.

Instances are not infrequent in which people have developt diphtheria at the close of a railway journey in which they did not knowingly come into contact with a sick person. Some of these persons were undoubtedly infected by carriers among their fellow passengers.

That dangerous carriers travel in considerable numbers cannot be doubted. A proved instance of a carrier of virulent diphtheria bacilli traveling by train and boat occurred recently in California. A school-girl who had past thru an attack of diphtheria was releast from quarantin after a single negativ culture, instead of the two required by the State Board of Health, and was allowed immediately to travel by railroad and boat to her home at the lighthouse on the Farallone Islands, which are situated in the Pacific Ocean about thirty miles west from San Francisco. Within a week her brother contracted a fatal attack of diphtheria and soon afterward examinations showed that two of the thirteen persons on the island had become carriers, and that the girl who brought the disease to this isolated community still had diphtheria bacilli in her throat. If any persons were infected by her during her trip to her home, it is not likely that they would have any idea as to the source of their infection. Had it not been for the fatal case at the end of her journey her carrier state would have gone unrecognized.

Diphtheria carriers played an important part in an epidemic of diphtheria on the United States Steamship Buffalo in 1903.[1] The conditions were favorable for an outbreak because the ship was crowded, and there was, therefore, unusual opportunity for contact infection. The epidemic originated from an unknown source, probably from a carrier among men recently taken on

[1] Harmon, G. E. H.: Report of an Epidemic of Diphtheria on Board of the U. S. S. S. Buffalo, report of the Surgeon-General, U. S. Navy, 1903, pp. 217–222.

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board for training. Among 750 men there were 137 cases, 18 per cent. During the epidemic it was found that 14 per cent. of the well persons were carriers. The outbreak was permanently ended by leaving on shore all persons who persistently gave positiv cultures.

In epidemic cerebrospinal meningitis we have a disease which is spread largely by healthy carriers who harbor the germs in their noses and mouths. Such conditions as would favor the spread of diphtheria would also increase the opportunity for outbreaks of cerebrospinal meningitis. We have an example of an epidemic of meningitis on shipboard in the experience of the United States Steamship Minneapolis.[1] In 1903 the disease was in all probability introduced into the ship either by a man in the incubation period or by a chronic carrier. The ship was unusually crowded. There were 1450 men on board while the normal complement was 500 men. Under these conditions an outbreak of 23 cases occurred.

In cholera, in dysentery (bacillary and amebic) and in typhoid fever we have three diseases which may be spread by carriers. In all three the infectious agent is usually given off in the feces and infects other persons thru the pollution of food or water.

According to Pannenborg[2] contact is a common method of infection with dysentery on shipboard. He cites four instances in which outbreaks of dysentery on German war-vessels could be explained only on the supposition that they originated from carriers. In tropical harbors, flies may perform an important part in conveying infectious material to food. If carriers have access to the water supply there is danger that it will become polluted and will cause an outbreak of dysentery.

The danger from cholera in the United States at the present time depends entirely on the carriers who cross the ocean in ships and infect persons en route and after landing. Fortunately we are being successfully protected against this menace by an efficient system whereby immigrants are kept under observation

[1] Stokes, C. F.: Report on Epidemic of Cerebrospinal Meningitis, U. S. S. S. Minneapolis, report of the Surgeon-General, U. S. Navy, 1903, pp. 229–234.

[2] Pannenborg, A. E.: Die Gefahr der Bazillenträger und Dauerausscheider an Bord. Archiv. für Schiffs-und Tropen-Hygiene, 1915, Vol. 19, Nos. 1 and 2, pp. 7–26 and 33–66.

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before they leave cholera-infected ports, and their feces are examined bacteriologically before they are allowed to land in the United States. In June, 1911, prior to the order of the Treasury Department requiring these bacteriologic examinations, a few carriers gained entrance to the United States, but luckily started no epidemics. The danger from cholera carriers on shipboard was shown by the experience of ships arriving at the port of New York between June 13 and August 18, 1911.[1] Sixteen cases of cholera had developt on these ships while they were at sea, fifteen more occurred during detention in quarantin, and three after release. Most of these cases were due to carriers among passengers and crew. The order requiring bacteriologic examination of the feces of immigrants from cholera-infected ports resulted in the discovery of thirty-one carriers on ships arriving in New York from July to November, 1911. Only four gave histories of cholera-like ailments. Two were from ships on which there had been no recognized cases of cholera during the voyage, and at least one of these men must have been a carrier before embarking.

The danger from cholera-carriers is greatly reduced by the short duration of the carrier state—seldom more than two months. The stools of cholera cases are usually free from the spirilla in twelve to fourteen days, and carriers who have not had the disease are in most cases soon rid of their infection.

All the historic epidemics of cholera have spread along the lines of travel, along the caravan routes across the desert, along the trading highways of the ocean, along the lines of march of armies. It seems to be a disease in the spread of which travel is especially involved. Cholera epidemics, when once under control, do not start up again until the disease is brought from another country by travelers. Carriers of long duration are so rare that they, alone, do not keep the disease alive in a community. Nevertheless the carrier state is sometimes of long enuf duration to permit the carrier to remain infectious during a voyage across the ocean.

[1] Craster, Chas. V.: Ship-borne Cholera. *Jour. American Medical Assoc.*, Dec. 20, 1913, LXI, 2211. Creel, R. H.: Method Employed at New York Quarantin for the Detection of Cholera Carriers. *Jour. Am. Public Health Assoc.*, Dec., 1911, I, 899.

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Within the United States typhoid carriers are common, and some of them are very dangerous. The number of these carriers is being kept up by constant accessions from those communities which fail to apply the well-known principles in the prevention of this disease. Every city which permits conditions to continue which produce a high typhoid rate is responsible for an annual output of typhoid carriers, some of whom will travel to more meritorious communities and help keep up the residual typhoid fever there. As passengers or employees on railroads and ships these carriers will also be sources of danger.

The number of typhoid carriers produced is a fairly definit proportion of the total number of cases and therefore every precaution to reduce the typhoid rate will at the same time cause a diminution in the number of carriers. According to Prigges[1] five per cent. of cases of typhoid fever remain carriers, and there are three carriers who have not past thru a recognized attack of typhoid fever for every seven who have. On this basis we reach the conclusion that approximately seven carriers are produced for every one hundred cases which are allowed to occur. Fortunately some of the carriers clear up and many do not infect other persons.

The typhoid carrier, as a passenger on a train, is not specially dangerous, but a carrier among the waiters or cooks on a dining car might infect the food of many people. Here are found the same conditions for easy transfer of disease which exist in a public restaurant. The danger of the infection of drinking water by carriers is being greatly diminisht since the handling of ice and the cleaning of water containers, and the separation of the ice from the drinking water have received so much attention in the regulations of the United States Treasury Department and the rules of the railroads.

On ships the typhoid carrier is more dangerous. The passengers live together, for a more or less extended time, under conditions of close contact similar to those in a crowded house. Carriers among cooks and waiters would have their opportunities for

[1] Prigges, quoted by Müller, P. T.: Vorlesungen über Allgemeine Epidemiologie, 1914, p. 9.

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infecting food, and the stewards and stewardesses, if carriers, would be likely to infect the passengers to whom they brought food.

With all these possibilities, the number of outbreaks of typhoid fever traced to carriers on trains, or ships is small and much infection is undoubtedly prevented by the supervision of sanitary arrangements by railroad and steamship companies and health officials. Pannenborg[1] has collected reports of typhoid fever outbreaks, due to carriers, on three war-vessels—one Japanese, and two German.

While sanitary precautions to a degree prevent the spread of disease on interstate passenger steamers, the conditions on some of the intrastate lumber and freight boats are ideal for the spread of typhoid fever from one member of the crew to the others. An example is furnisht by a carrier in the crew of a lumber steamer sailing from Humboldt County to San Francisco.[2] An investigation by the California State Board of Health showed that this carrier, altho he had nothing to do with the preparation or serving of food, had spread the infection to 27 sailors and officers, four of whom had died. Twenty-six of these infections took place during a stay of three years and seven months on one vessel which carried only 22 men. The conditions on board gave opportunity for the transfer of infection in the crowded forecastle, and in the dirty water closet, but especially by means of a cask for drinking water. This cask was filled with water in port, and during the voyage the men dipt drinking water from it with a common cup, frequently wetting their hands in the process. Under this arrangement pollution of the water was unavoidable.

This carrier was placed under quarantine at the Marine Hospital in San Francisco and was studied and treated by officers of the United States Public Health Service with a view to making it safe for him to return to his trade. At the end of seven months he was releast on parole because the typhoid bacillus had not

[1] See second foot-note on p. 182.

[2] Sawyer, W. A.: A Typhoid Carrier on Shipboard. *Jour. Am. Med. Assoc.*, May 4, 1912, Vol. LVIII, p. 1336.

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been found in his feces for four months. He found work on a lumber vessel and shortly afterward infected three sailors, one of whom died. An investigation by the officers of the United States Public Health service showed that this ship, like the other one, had a drinking cask into which the men dipt a common cup, wetting their hands as they did so. Conditions like these would be serious even in the absence of an unusually dangerous carrier like the one reported. The drinking water supply on board a ship should be in a closed container to avoid contamination and should be drawn thru a faucet.

PRECAUTIONS AGAINST INFECTION FROM CARRIERS.

The danger from carriers on railroads and steamboats can be reduced by diminishing the opportunity for transfer of infection from one person to another and by detecting and controlling the more dangerous carriers.

Great advances have already been made in diminishing the opportunity for the transfer of infection to passengers from other passengers or employees. The interstate quarantine regulations promulgated by the United States Treasury Department forbid the providing, by common carriers, of any drinking cup or glass for common use in cars, ships, or depots. The individual paper cup on trains and the bubbling fountain in stations have taken the place of the common drinking glass which used to furnish such an obvious opportunity for transferring germs from the mouths of carriers to those of well people. The interstate quarantine regulations forbid also the furnishing, by common carriers, of any towel for the use of more than one person, thus decreasing the danger from carriers. Drinking water is protected from the danger of contamination by carriers, especially typhoid carriers among employees, by the regulation that ice shall be handled in such manner as to prevent its becoming contaminated with disease organisms. The railroad companies have their own regulations regarding special buckets and carts for ice and the use of ice tongs and rubber gloves, all designed to avoid the touching of ice with hands and to prevent clothing from coming in contact with it.

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The danger of the less immediate contacts is diminisht by the rules of the railroad companies regarding the cleansing of cars, the changing of the linen covers and head rests, and the cleaning and disinfecting of toilet rooms.

On passenger ships engaged in interstate traffic, precautions similar to those of the railroad companies are being taken. It is in the coastwise steamers which do not carry passengers and are not interstate carriers that we find conditions very favorable to the transfer of infection from carriers to other members of the crew. On these ships, the storage of water in open casks, accessible to the crew, the use of the common drinking cup, the crowding of the forecastle, and the use of insanitary toilets are sometimes still found and should be corrected.

The best of sanitary arrangements would not entirely prevent the danger from carriers on trains and boats. It is necessary that the more dangerous carriers should not engage in certain occupations. Greatest care must be taken to exclude the typhoid carrier from service in the kitchen or dining room of steamboat or train. The Southern Pacific Company requires that all aplicants for appointment to positions on trains or in stations shall be examined physically when admitted to the service and applicants found to be suffering from any disease that would make their employment in that service inadvisable are rejected. With cooks and waiters there is additional provision for re-examination on suspicion that they may be suffering from a disease which would make them dangerous to the traveling public. How far these examinations protect against the employment of carriers depends largely on the ability of the examining physician to get at the facts, in the carrier's past history, which would lead to suspicion of his condition. Laboratory tests could then be made, but even in the absence of laboratory proof no person with a very suspicious history should be employed in a position where a carrier would be dangerous, because many carriers are intermittent in the discharge of their disease germs.

The protection against carriers depends to a large extent on co-operation between health departments in detecting and keeping under surveillance dangerous carriers. All outbreaks of com-

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municable disease should be investigated. If carriers are discovered they should at least be kept from engaging in occupations in which they would be specially dangerous. If a carrier moves away from the jurisdiction of the local health officer, the health officer at his point of destination should be officially notified so that he will be responsible. In this way the danger from carriers both on and off boats and trains would be diminisht.

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THE CONTROL OF TRAFFIC SEWAGE.

By LESLIE C. FRANK, Sanitary Engineer, United States Public Health Service, Washington, D. C.

INTRODUCTION.

The possibility that traffic sewage, such as sewage from vessels and railway coaches, might require treatment for the protection of the public health has been under consideration within recent years by various state and municipal authorities, and is now being studied by the United States Public Health Service and by the International Joint Commission.

Naturally the public interests, exprest thru the above bodies, desire that such dangers as exist due to this cause be removed as promptly as possible by proper remedies. Naturally also, the traffic interests desire that it be reasonably demonstrated: First, that there is real danger due to the present practices of discharging traffic sewage, and second, that any remedy they are askt to apply be practicable, efficient, and within economic limits.

Both of these viewpoints are reasonable and just. It is probably safe to assume that while some of the smaller traffic interests may be actuated by less public-spirited motives the vast majority of the traffic interests view the question with the broad-mindedness above indicated and are willing to apply any correctiv measure which may be shown to be reasonably necessary and economically possible.

It is the purpose of the present paper to set forth some of the reasons why a better control of traffic sewage is desirable and necessary, as well as some of the methods of control which have been attempted or suggested, with their relativ advantages and disadvantages.

THE NEED FOR THE CONTROL OF SEWAGE FROM FRESH WATER VESSELS.

The present practice on most fresh water vessels is to discharge sewage from the toilets directly overboard. In some cases small

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holder or storage tanks have been installed, but in general the discharge of sewage is not controlled.

The danger from this present practice lies in the relation between such non-controlled discharge of sewage, the drinking water supplies of other vessels, and the drinking water supplies of communities whose intakes lie within the bacterial zone of influence of the traffic lanes.

The drinking water supply of one vessel is related to the sewage discharge of another because vessels between two given ports generally travel in very well defined lanes, since naturally the logical tendency is to select the shortest practicable route. Such traffic lanes between important centers are often heavily congested, so that a number of steamers may pass the same spot within a few minutes. In view of this it is hardly possible to doubt that the drinking water intake of one steamer may often be exposed to local zones of pollution from another steamer.

The above mentioned traffic lanes pass close by a number of drinking water intakes of large cities, and it is just as little subject to doubt that disease may be transmitted in this way as that it may be transmitted from vessel to vessel. Chicago is one of the cities suffering in this regard, and its authorities have become sufficiently convinced of the danger to require vessels entering or leaving that city to install carrying devices "so that no sewage may be discharged within a certain distance of the intakes, or while in the harbor."[1] The City of Buffalo also recognizes this difficulty and its Health Department has made a request that all toilets must be lockt and remain lockt and no sewage be discharged from the entering or leaving vessels within two miles of the intake pipe of the Buffalo City Water System.[2]

The traffic interests recognize the above stated dangers to the extent that some of them have expresst themselves as being willing to try any reasonable method which may be suggested. At a hearing before the International Joint Commission on November 10, 1914, in Detroit, Col. Wm. Livingstone, President of the Lake Carriers Association, said:

[1] de Valin: U. S. Public Health Service Reports.
[2] Appendix, p 383, Progress Report 1–16, 1914, International Joint Commission.

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There is nothing that money can buy that is not put on all of our steamers, both bulk freighters and passenger ships, and there is no improvement up-to-date that we do not put on. The question of expense does not cut any figure with us. The only question that comes up in our minds and that decides it is, will the improvement which is added accomplish the purpose aimed at in the most efficient way? This question of sterilization tanks on board boats, while not a new proposition, has never been put into practical use, and so we cannot vouch for it. We will give you one boat, or two boats, or three or four boats, if you so desire, if you want to put a tank on board and test it out. We will help you in every possible way. * * * Clearly understand that we want to co-operate with you and that we are not opposing anything that is reasonable.

It is evident, therefore, that the public interests recognize the danger of non-controlled discharge of sewage from fresh water vessels, and that the traffic interests are in sympathy with any movement looking toward improved public health conditions.

THE NEED OF THE CONTROL OF SEWAGE FROM RAILWAY COACHES.

The need for controlling sewage discharge from railway coaches has been recognized by many of the state and municipal authorities. This need is due to the relation between the discharge of the train sewage and the possible pollution thereby of drinking water supplies within the zone of bacterial influence of the railway roadbeds.

This bacterial zone of influence is determined by two factors, namely, surface drainage and wind action.

Particular attention is paid in modern railway construction to the rapid drainage of the roadbed. Longitudinal and lateral drains are specially designed to carry the surface drainage as rapidly as possible to the nearest watercourse. It is generally acknowledged that it would be extremely hazardous to drink water that had come into contact with fecal matter, even tho the fecal matter had been exposed to the sun and air for days. It can hardly be doubted, therefore, that the discharge of untreated sewage upon railway roadbeds which drain into drinking water areas is extremely dangerous and should be prevented.

The other factor determining the zone of bacterial influence of a railway roadbed is wind action. Drinking water reservoirs which may not be affected by surface drainage from the railway

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roadbed may nevertheless be within the radius of the wind's carrying capacity. Bits of dried fecal matter or particles of earth impregnated with fecal matter or urine may at any time be blown by the wind into such reservoirs. The case of the reservoir at Lawrence, Kansas, is an illustration. Mr. C. A. Haskins, Engineer of the Kansas State Board of Health, states that pollution of the water of the Lawrence Reservoir could be traced to no other course than the above mentioned carrying of polluted dust by wind action.

Recognition of the above dangers is indicated on the part of the public interests by the formulation of remedial measures such as the compulsory locking of toilet doors, and on the part of the railway interests by sincere attempts to apply these measures.

ATTEMPTED OR SUGGESTED METHODS FOR THE CONTROL OF TRAFFIC SEWAGE.

Roughly there are six different methods of control which have been attempted or which suggest themselves.

The first of these methods is not to attempt to control the sewage as such but instead to purify that part of the affected water supplies which is actually used for drinking water.

There are several important objections to this method, one being that it would be apt to impose a very unjust burden upon the users of the affected water supplies, and the other being that it deliberately neglects the "factor of safety" idea.

In regard to the first objection, the number of persons taking passage during the season 1906, according to the United States Census Reports, was 14,000,000. Assume that the passenger season embraced 120 days. The average number of persons traveling on the Great Lakes every day during the season, therefore, may be assumed roughly to be 14,000,000 ÷ 120 = 117,000. In fact the average continuous population is much less than this because the average trip length is less than one day. It is believed to be a safe assumption that a good many more than 4,000,000 people depend for their drinking water supplies upon the waters of the Greak Lakes, and that they have their intakes located in such a way that the possibility of occasional pollution

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from vessel sewage cannot be ignored. Manifestly, then, it would be unfair for 117,000 people to place the burden of water purification upon 4,000,000 people. The fact that many of the above 4,000,000 empty their own sewage untreated into these same Lake waters is not pertinent here. The necessity and duty of purifying *their* wastes is also under consideration.

The same argument will hold for railway traffic and the population which the sewage of that railway traffic affects.

Finally, consider for the moment that the shore population *does* purify its drinking water by means of filters. The probability still remains that the pollution from steamers is likely to appear occasionally in high concentrations at the city water intakes and cause momentary intensities of pollution beyond the limits of municipal water filters. So that even if the shore population did accept the whole burden, and purified its drinking water by means of the most modern water filters, they could not be sure they were being protected against the above hazard.

The second objection to method (1) is that it neglects the "factor of safety" idea. For, if the water purification device of any vessel happened to be out of order, polluted water from the traffic lane might at any time be served to the passengers. It would be much better to purify *both* sewage and water and so place the hazard of infection in the second order of possibilities. Of course, any argument of this nature depends upon the possibility of devising methods of water and sewage purification whch are within the limits of economic expenditure.

The second method of traffic sewage control is to keep all toilets lockt while steamers and trains are within danger zones. This method of control has the advantage of being extremely low in cost for the traffic interests, and of being extremely efficacious if thoroly executed.

The objections are two-fold: In the first place, the locking of toilet doors, as will be attested by every traveler, often affords a very serious inconvenience; in the second place, it is extremely doubtful whether the method *can* be thoroly executed. Personal observation of unlockt traffic toilets while passing over drinking water areas has afforded ample reason for this doubt. Mr. C. A.

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Haskins, Engineer of the Kansas State Board of Health, makes the following statement:

> In 1913 the Kansas State Board of Health ordered the Missouri, Kansas and Topeka Railway to instruct its trainmen to keep doors of toilets lockt on passenger trains while crossing the drainage area of the Parsons, Kansas, water-supply, so as to safeguard the water against infection from this source. During the period of two years since this order has been in effect many infractions have been noted by representatives of the Board.

The greater the number of men to whose care is entrusted the execution of a certain duty the greater the likelihood that infractions will occur, unless such infractions create their own remedy. Col. Livingstone, previously referred to, made the following statement before the International Joint Commission on November 10, 1914:

> In the end you have to depend on the men, and all of our men are not saints. * * * I put it to the Commissioner whether it is possible, among 17,000 or 18,000 men, to have all your rules strictly obeyed. I do not care what the penalty may be; I doubt if every rule will be obeyed among any class of men numbering so many. A man knows that if he commits murder he will be hanged, but still some people will commit murder.

The third method of controlling traffic sewage is to provide storage tanks in which the sewage is to be held during passage over danger zones, and discharged by manual operation after the danger zone is past. This method has the undoubted advantage that the toilet doors remain open continuously. It is open to the same objection above noted, however, namely, that its success depends upon the integrity of a large number of employees.

The fourth method is to provide storage tanks as outlined above, and to treat the contents before discharge with chemical disinfectants. This method has the advantage of continuously open toilets and also that discharge of the tanks may be effected anywhere. The principal objection to this method is that ordinary chemical disinfection loses much of its efficiency when it is called upon to treat liquids containing such solids as fecal matter. It is extremely difficult to secure thoro penetration of the chemicals into the interior of the particles, and much time and effort has been spent in attempting to devise methods whereby auto-

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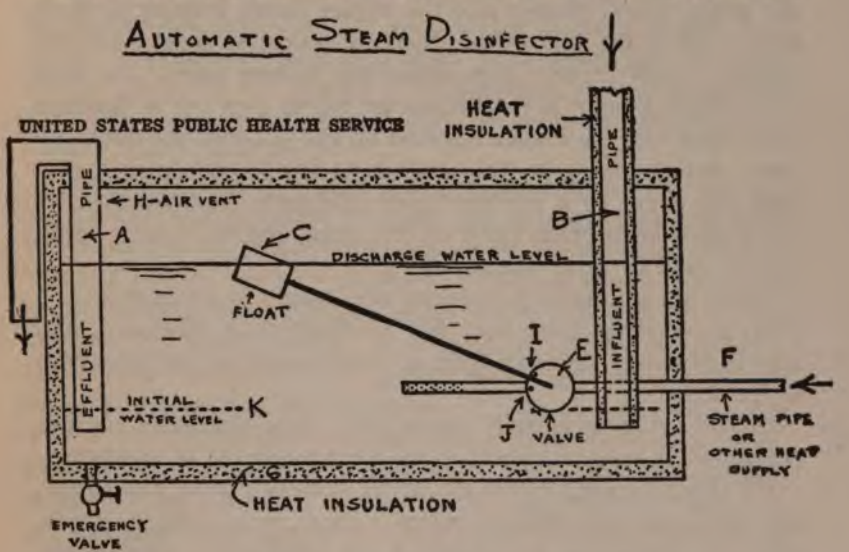
matically the organic particles may be sufficiently comminuted before the chemical is applied. So far as is known no practical success has attended these efforts. Of course, chemicals can be used which will entirely consume the organic matter by actual chemical combination, but such a procedure would be obviously expensiv. A second objection is that this method also is dependent upon manual operation.

The fifth method of control is to provide storage tanks as above and to treat the contents by manual operation with steam



before discharge. This method possesses the distinct advantage that the disinfection efficiency is dependent upon heat instead of upon chemicals and there is no doubt that heat will penetrate organic solids much more quickly than will disinfectant chemicals. However, it again possesses the distinct disadvantage of being subject to manual operation by many employees.

The sixth method of traffic sewage control is to provide storage tanks for the sewage so equipt that the sewage is both automatically disinfected and automatically discharged by means of steam or other heating element when it has reacht a certain

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predetermined level in the tank. This method has been described in Reprint No. 247 of the Public Health Service Reports. Briefly, the device consists of a tank as shown in the illustration, with a sewage influent pipe penetrating nearly to the bottom; a discharge pipe having its influent end near the bottom of the tank and rising up thru the tank to a point above it; a float and valve with a lost motion connection; and a steam influent pipe. The operation of the tank is simple. When the sewage has reacht a certain predetermined level the float automatically turns on the steam, which escapes into the sewage thru a number of small holes. All of the heat of the steam, of course, is given up to the sewage, which rapidly approaches the boiling point. As soon as the boiling point is reacht, *but not before*, pressure is developt in the tank and the sewage is forced up and out thru the discharge pipe. When, owing to this discharge, the sewage level in the tank has dropt to a predetermined minimum the float, thru its lost motion connection, turns off the steam and the tank is ready for the next cycle of operation.

There are a number of distinct advantages of method (6):

(*a*) It depends upon heat for its disinfection efficiency, and heat is generally acknowledged, as above noted, to be very thoro in its action.

(*b*) Its action is entirely automatic. This eliminates the uncertainties of manual operation by a large number of employees.

(*c*) If fresh sewage enters the device while it is being discharged, the discharge immediately ceases. There is no danger, therefore, of fresh sewage being carried out untreated. This advantageous feature is due to the fact that as soon as any fresh sewage enters the device its contents are chilled to a temperature at which pressure is impossible. The new mixture must again be brought to the boiling point before further discharge will take place.

(*d*) It permits toilet doors to remain unlockt over drinking water areas.

(*e*) It permits toilet doors to remain unlockt while waiting in stations. This latter has, of course, no public health significance, but it does concern very nearly the comfort of the passengers.

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In lieu of locking the toilet doors while standing in stations, the porter has merely to turn off a steam valve penetrating the car floor external to the toilet. The tank can be designed with a sufficient reserv capacity to care for any reasonable period of waiting. The objection will be raised immediately, of course, that the porter may forget to turn on the valve when the train leaves the station. This is true, but forgetfulness of this sort will rapidly create its own remedy. For, at the station stop immediately subsequent to the complete filling of the tank and its consequent dribbling, the fact of the porter's forgetfulness would be made painfully evident by toilet discharges upon the station platform. It should be remembered in this connection that the porter cannot help himself in such an emergency by locking the toilet doors.

The above device is now being experimented with upon a stationary basis in order to secure the maximum simplification of details and to secure data upon steam, consumption and bacterial efficiency. As soon as these studies are completed experimental devices will be placed upon vessels and railway coaches and tested in actual service. It is believed that the cost of operation will be extremely low. Rough preliminary office estimates indicate that the cost of disinfection with the above device should not be over two-tenths of a cent per cubic foot of sewage disinfected. This preliminary estimate is based upon the assumption that one pound of coal in the average modern locomotiv will evaporat six pounds of water, that locomotiv coal costs $1.50 per ton delivered into the locomotiv, and that heat lost by radiation from the device will double the amount of heat otherwise required. This certainly should be more than sufficient allowance for radiation.

Based on the above estimate, sewage disinfection for a railway coach which used ten cubic feet per day for toilet flushing will cost about two cents per day. The cost for steamers will probably be somewhat higher owing to the greater amount of water used per toiler flush. An estimate of five or ten cents per closet per day would seem reasonable. The steamers could of course reduce this considerably by substituting railway toilets for their present equipment.

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THE TRANSPORTATION OF INSECTS, WITH SPECIAL REFERENCE TO DISEASE CARRIERS.

By VERNON L. KELLOGG, Professor of Entomology, Leland Stanford Junior University, Cal.

That historic ship-captain, who, because of some real or fancied slight on the part of the natives of one of the Hawaiian Islands on which he had landed to replenish his water casks, left on shore, with his compliments, as he sailed away, a cask of his old supply swarming with mosquito wrigglers, introduces quite pertinently and exemplifies quite clearly the subject of dangerous insect transportation and distribution.

Whether these wrigglers were larvae of the yellow fever mosquito (*Aedes calopus*) or not, we cannot be sure, for altho *calopus* is abundant on the Islands, it is only one of the eight or nine mosquito species that we know to occur on the Hawaiian Islands. But in some such way it is quite certain that the yellow fever mosquito was introduced into these Islands, as is true also for *Culex fatigans*, the carrier of those minute thread worms, the filariae, that cause elephantiasis, and is also true of the half dozen other mosquito kinds represented in Hawaii. For there were no mosquitoes on the hot flanks of the great volcanoes as they rose from the blue waters of the Pacific in those distant days of the successiv births of the Hawaiian Islands. Both the flora and fauna of these islands had to be brought to them in one way or another. The various means and manners of such bringing are the chief subjects of the familiar "modes of dispersal" and "means of distribution" chapters of the text-books of zoo- and phytogeography. Ocean currents, persisting winds, floating logs, swimming, flight, carriage by long-distance ships or short-distance nativ boats, and the rest; these are the various ways of the over-seas distribution of life. But there are also interesting conditions attending the distribution of animals and plants merely overland. It is our special purpose, for the present few minutes, to scrutiniz and consider those particular ways in which insects, and particularly those insects which have already

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been proven guilty, or seem plainly suspect, of disseminating human disease, distribute themselves, or get distributed in spite of themselves, both over-seas and over-land.

The yellow fever mosquito is a good insect to begin with. It is a most important insect from the point of view of the man of medicine. For only in lands and regions where it is, is there, or *can* there exist yellow fever. Which, however, is not at all the same as saying that wherever this mosquito is, there is also always yellow fever. Yellow fever, for example, does not exist in the Hawaiian Islands nor in the Samoan Islands, altho the yellow fever mosquito is one of the most abundant of the mosquito kinds occurring in both these island groups. This absence of the disease, altho the disease spreader is present, is only evidence of the fact, familiar to you all, of course, that the yellow fever mosquito, no more than the malarial or the filarial mosquito, manufactures *de novo* the disease it carries. The insect simply collects the causes of the disease, and carries them further.

Yellow fever is caused by the so far undistinguisht and probably invisible but definitely existing sporozoan parasite that we call its germ, just as malaria is carried by the familiar Hemamoeba, or Plasmodium, and elephantiasis and other forms of filiasis by the wriggling little threadworms called filariae. What is needed then in the Hawaiian Islands that there may be yellow fever there, are the yellow fever germs. The insect agent that distributes these germs is ready and waiting, and now that the Panama Canal offers a swift and all tropical, or sub-tropical, journey from the West Indies, where are both the proper germs and the proper mosquito host, to the Pacific islands, where as yet only the proper mosquitoes are, the news ought not to be too long delayed of the first cases of yellow fever in our Pacific island holdings. What yellow fever might do, if allowed its way at all, among the absolutely non-immun populations of these islands, can well be imagined.

This possible, not to say probable, passage of the yellow fever germs, in the bodies of yellow fever mosquitoes (or human yellow fever patients), from Havana to Honolulu demands, however, not only means of passage for the infected mosquitoes but a long

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enuf life of the mosquito and of the germ in it to endure thru the time of the traveling. And this is a condition that is to be taken into account in all study of insect transportation. We are little interested in the transportation of dead insects from one place to another—of insects that die inevitably of old age during the journey,—or of live insects with dead disease germs in them. In the particular case of the yellow fever mosquito, however, we have to do with an insect very fit to be a globe-trotter. It is, of all the mosquitoes, the particular one for which we have perhaps the longest records of adult longevity. It has indeed many records of from 100 to 150 days of life in the winged stage. This length of life is sufficient to enable it to be carried on ship-board half-way around the globe if it can withstand the vicissitudes of temperature and climate, generally, which might attend such a ship.

However, mosquitoes have their special means of withstanding precisely these vicissitudes. In the first place, the adult females of most mosquito kinds can hibernate thru a cold period, and estivate thru a hot one. Also the mosquitoes are enabled to meet different conditions of life and of travel by different adaptations in their different life-stages. As larvae, or wrigglers, mosquitoes can be taken anywhere that fresh or brackish water can be. And while, ordinarily, mosquito larval life is but a few days or weeks in duration, I have kept wrigglers alive and slowly developing thru a period of more than three months. Again, as eggs, mosquitoes have special means of withstanding such conditions as heat and desiccation and new means of rapid and wide dispersal. The eggs of many species are deposited not always on the surface of water as is the more usual case, but on mud or moist soil which may dry and turn to dust and yet not affect the eggs for the worse. For with the coming again of the rains or over-flowing stream these eggs will develop and quickly hatch. Or instead of lying in place as deposited they may be taken up with a bit of mud on the feet of birds come to drink at the drying pool, and be carried to distant places.

Finally, in any consideration of the means of distribution of mosquitoes, we must not leave out of account the flying capacity

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of the adult. Despite the fact that most mosquitoes tend to dive into protecting foliage or grass when a wind arises, some kinds are known to make flights of from a few to as many as 30 or 40 miles against a wind not too strong. And with the wind it is conceivable that they may attain even longer journeys. The campus of Stanford University lies about $2^1/_2$ miles from the marsh-lined shores of San Francisco Bay, but nevertheless it suffers each year from the invasions of swarms of a mosquito kind that breeds exclusively in the brackish waters of the salt marshes. We have taken specimens of these mosquitoes five or six miles inland on one side of the bay and as many as 15 miles inland on the other. The salt marsh mosquitoes of the New Jersey Coast have been taken for nearly forty miles inland.

I have as yet, spoken of the distribution of no other kinds of insects than mosquitoes.

However, I have been able to illustrate, by examples from the mosquito alone, all the principal categories of the ways of insect dispersal. That is, insects may be distributed by their own capacities for locomotion, as the mosquito by flight, or they may be transported by various natural agents, as the mosquitoes' eggs by birds, or they may be distributed by the individual assistance of man, as the larvae in casks of water carried by wagon, railway or ship. It is, however, the methods of the last category that chiefly account for the rapid and world-wide distribution that so many of the insect carriers and disseminators of human disease have achieved. For in the very nature of the case these insects are necessarily those that live in closest relation to man, either as actual external parasites on his body, as the lice, mites, bedbugs, etc., or as parasites of the domestic animals which he keeps ever with him in his migrations, as the fleas, stable-flies, ticks, etc., or as constant guests of his food stores, as the roaches, or breeders in the offal of his house or stable, as the house flies. All these insects, and they include most of the proven disease-carriers—the most notable exceptions are the mosquitoes and the tsetse flies—are close associates of man and his domestic animals and pets, his house and his stable. So that a study of their transportation largely resolves itself simply into a care-

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ful consideration of the special various opportunities which man affords these insects for transportation, thru the constant movements of himself and belongings in migration, colonization and commerce. This study can best be exemplified, perhaps, by the brief consideration of these opportunities or necessities of transportation as revealed in connection with each of the more important disease-carrying insects.

First, then, let us consider the Pediculines, the blood-sucking lice that live as parasites in both immature and adult stages on man and most of his mammal companions. There are three species that, both as young and adult, infest man and only man, and two of them, at least, have been definitely implicated with the spread of typhus fever. Altho the causativ organism of this disease is yet unknown, it is quite certain that the disease is germ-caused, and that the unknown germ can be suckt into the stomachs of lice with the blood of diseased persons and regurgitated again into the blood of other persons. As to the transportation of the lice it is obvious that they can go wherever unclean men go. Cheap lodging houses, night shelters, jails, and wherever unclean men come closely together and disperse again are centers of distribution. Mexico is the special danger region for this country as typhus is always present there—and so are lice.

The bedbug, altho not a permanent parasit of man is yet a permanent guest and companion in his house and on his travels by train and boat. In both immature and adult stages it sucks his blood, as the lice do. It is obvious that its blood-sucking habits and repeated change of human hosts adapt it well to the fatal business of spreading the parasites of germ-caused disease, and as a matter of fact the bedbug is proven guilty or made strongly suspect of spreading by its bites no less than half a dozen serious diseases caused by various bacilli and sporozoa. It is a cosmopolitan insect, and very prolific, having three or four generations a year. It has considerable longevity and in both immature and adult stages can go for long times without food. Adults have been kept alive in a bottle for a year without food. Young have been kept without food from birth to their forty-second day of life. The young and adult live in any safe dark cracks or

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crevices in the permanent or temporary habitations of man. All these conditions make the transportation of these insects easy. They go, in fact, wherever man goes, resting near him in boat and train births, and in the plush seats of the parlor coach, as well as the wooden or wicker ones of the emigrant car.

Like the bedbugs, the fleas are only temporary parasites of man, not living on his body all the time. In fact they take his blood only as adults and only with special opportunity. For in their immature stages as slender whitish grubs they live on the organic dust of cracks and crevices in houses, dog kennels or cat-baskets, and in the adult period they take blood from hosts of various other animals as well as man, as the dog, cat, rat, etc. But this latter condition gives them a special danger. For they may and do, in certain cases, at least, carry diseases from these other animals to human beings. Bubonic plague is, of course, the chief disease of this type, and it is a disease proved to be disseminated among rats and from rats to man by fleas. Interestingly enuf it is not yet proven that the fleas carrying the plague bacillus directly inoculate the host by piercing its skin and sucking its blood, but by their regurgitations and anal disjecta they distribute the bacilli of the plague on the surface of the body, whence they may find access to an open sore, or can be rubd into the wounds made by scratching. The transportation of fleas in egg and larvae stages can be accomplisht by unclean train or boat, and in the adult stage by the actual migrations of the hosts, or by their artificial dispersal by man. The flea species *Zenopsylla cheopis*, especially associated with the dissemination of the bubonic plague among rats and man in the Orient, was brought years ago to San Francisco (and to every other great seaport of the world). It found a pleasant abiding place with the rats of the American city and is abundantly with us to-day. But that it may distribute plague it must have opportunity to feed on plague-infested rats and of those fortunately we allow now but few to land; and these only by virtue of eluding a very strict preventiv watch. Tin shields on the hawsers that run from ship to wharf, rat-hunting on board ship and various other preventiv means tend to make the transportation of the rat plague flea a difficult one nowadays.

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In the ships with the lice, bedbugs and fleas, come the cockroaches. These insects which have not yet been proved to be the incubators of any germ disease, that is, the actual alternate host of any sporozoan parasit whose other host is man,—as the mosquito is for the malarial parasite, for example—have nevertheless been proved to be able to ingest and after twenty-four hours and even longer to eject by regurgitation and defecation the living vibrios of Asiatic cholera, and are among the most indefatigable and abundant ship-travelers known. Good proof of this lies in the fact that the commonest roaches now living in our houses this country over, are not nativ species, but two kinds nativ to Europe and Asia, respectively, namely the small German light brown roach commonly called "croton bug" and the larger dark brown or blackish Asiatic roach known as "black beetle." On the other hand, the still larger best known American species *Periplaneta americana* rules the roost in Mexico and Central America and in many of our Pacific Islands. It is the most numerous roach in Manila. I have known of boats arriving in San Francisco from west coast Central American and Mexican ports on which the men in the forecastle wore gloves at night to save their finger nails and even flesh from being nibbled away by cockroaches. It is indeed the "foksel" of the ships—and also the galley—which are the very seat and center of the ship-transported insects of disease-carrying potentiality. For in the "foksel" not only are closely foregathered men with not too much opportunity for cleanliness, but here are their animal pets, their flea-bitten dog and cat companions. And in the galley are the food and warmth and moisture that the roaches like.

Altho not insects but Arachnids, more closely related to scorpions and spiders than to lice and bedbugs, the mites and ticks must have a few words. For certain ticks have been clearly proved to be disseminators of disease among animals and men. In our country the cattle tick spreads the Texas or splenic fever of cattle, and the Rocky Mountain spotted fever tick carries the spotted fever of human beings in the mountain states of the northwest, while in northern Africa the notorious moubata

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tick disseminates the fatal African relapsing fever. In addition, certain mites produce by their very presence on and in the skin of man a condition, *scabies*, that may be well be lookt on itself as a disease, while others produce similarly the mange of dogs and a fatal itch in cats. It is almost certain too, that mites will be proved to be carriers of disease germs. The habits of some species adapt them very well for this role.

Both mites and ticks are most readily transported on the bodies of their animal and human hosts, but the capacity of the ticks to go for extraordinarily long periods without food renders them capable of being carried long distances by even the slowest of transporting agents under conditions where no food can be had for weeks or months. Unfed adult ticks have been kept alive by various experimenters for from a year to even three years. Eight species of mites and ticks have been recently determined to be harbored on rats in Egypt and most of these rats are thoro cosmopolitans.

The general relation of house flies to the dissemination of human disease is familiar to you—or perhaps I should better say, the general possibilities of this relation, for as a matter of fact, the actual proved cases of the dissemination in nature of germ-caused disease by flies are as yet not many. But that is only because of the difficulties of the determination. Experimentally it is easily proved that flies can carry about living disease germs, and there is little doubt that typhoid, tuberculosis, cholera, yaws, and other serious human diseases, as well as several serious diseases of domestic animals, are actually disseminated by these insects, altho by no means exclusively so disseminated as yellow fever and malaria are exclusively disseminated by mosquitoes. Indeed the housefly has not yet been proved to be the actual definitiv host (alternat host) of any disease germ.

But it is quite true, as shown by experimental proof, that the germs of all the human diseases I have just specifically named, namely typhoid, tuberculosis, cholera and yaws, can be taken into the stomach of flies and ejected in viable condition for at least two days after feeding. Experiments are under way in various laboratories—a graduate student in my own laboratory

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has already got some interesting results with the bacilli of tuberculosis—to determine whether or not disease germs ingested by the larvae can persist alive thru the larval and pupal life of the fly and be ejected with the vomit and feces of the adult fly. The tremendous histologic changes during the prepupal and pupal stages, accompanied by the breakdown of the larval alimentary canal and release of the bacilli into the general body cavity, would seem to make such a persistence of the germs in a mere mechanical carrier impossible,—but my student seems to be demonstrating a recovery of live tubercle bacilli from bred flies fed as larvae on bacillus-infected food.

As 90 per cent. of houseflies lay their eggs and live as larvae in horse manure, and as the whole immature life can be past in as few as nine or ten days, under favorable conditions, it is plain that houseflies can be readily transported overland and overseas with horses and can actually multiply during their journey. But in default of horse manure flies will breed in almost any kind of filth and any transported filth can carry the eggs and larvae with it.

The migrations of the adults by flight are undoubtedly limited in extent. Usually flies are not found more than from a quarter to half a mile from a breeding place, but some records of flight reach the figure of five or six miles. But the life of the adult is long enuf, especially in the cases of hibernating individuals, to permit of a wide distribution of artificial transportation of the flies themselves. And as their association, because of their origin, is always a close one with man their travels are easily accomplisht with ever-traveling man.

The biting stable-flies differ from the houseflies in their possible effectiveness and behavior as disease spreaders by their possession of a piercing beak with which they suck blood. They have thus opportunities for directly inoculating human beings or domestic animals by introducing into the circulation disease germs that have been simply mechanically carried by the beak, or have been swallowed with the blood of previously bitten diseased individuals. For a time, you know, the stable-fly was under grave suspicion in connection with infantile paralysis,

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but its reputation seems gradually to be clearing of this imputation, at least. And the same is true of its possible relation to pellagra.

However, it is an insect well adapted to carry and inoculate disease. Its favorite breeding place is straw; it can travel where straw travels, and its larval and pupal stage, enduring for from three to six weeks, is long enuf to let it be carried for long distances unperceived. The issuing adult takes blood from domestic animals and human beings. It does not, however, feed on filth, nor frequent malodorous places to any such extent as the housefly, and thus is not so likely to pick up and carry on its feet or body surface the germs of typhoid and other intestinal diseases.

Related to the stable-fly are the notorious tsetse flies of Africa, disseminators of the fatal sleeping sickness of human beings and nagana of stock. But they will probably not trouble us, despite such interesting rumors as found credence a few years ago concerning the bringing of the eggs of the tsetse into this country on the skins of the animals shot by Mr. Roosevelt's famous African expedition! The rumor was, I say, interesting, but more for its revelation of the ingenuity of the hard-prest reporter who invented it, than for its connection with possible fact and hence danger to us. For the tsetse fly lays no eggs. The female gives only birth occasionally to a single living larva almost ready to pupate. It is indeed a curious slow-breeding creature for an insect.

Almost any insect that associates at all closely with man, that sucks his blood or eats his food-stores, or gnaws his furniture, or breeds in his house or stables, is a potential disseminator of germ-caused human disease. And almost any such insect, by virtue of this close human association, is likely to be readily transported by man's own unintentional aid. This is, indeed, not only logically obvious, but observationally proved by the fact that a great majority of these insects are cosmopolitan; they have already gone with man wherever he has gone. They are usually the first insects to appear on an island taken possession of by civilized man; with himself, his goods, and his chat-

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tels, he transports disease germs and insect disease germ carriers. It is an old story, and an oft-repeated one. The moral of it is, to look well to the baggage we take about with us. For the transportation and distribution of the disease-carrying insects is chiefly a matter of our own behavior, and, as such, not being primarily an inherited behavior, it can be successfully modified in a direction making toward safety.

DISCUSSION.

Dr. Adelaide Brown, San Francisco:

I was askt to speak on Dr. Rucker's paper particularly, and he mentioned the question of education. I think some of the people who need education are the architects. There is a fad in building nowadays which undermines the protection of health, and that is the separation of the toilets from the bath-rooms. I believe in the training of children we have our great possibility for disease protection. In the taking of washstands out of the toilets, you encourage the child's carelessness in omitting the washing of his hands after attending to the calls of nature. Children should be taught also to wash their hands before meals. If these two things could be taught in every family, we would have much less throat infection and typhoid fever. It is easy to train children to become mechanical in such things before entering school.

If he is properly trained before going to school, the child would rather go thirsty than drink out of a public drinking cup. To many the bubbling fountain seems ideal, but the comment of a little child was very illuminating to me. He said, "I would not drink out of the drinking fountain at school because the boys spit in it." It is a toy and the children will play with it.

The proposition in regard to the controlling of sewage on trains and boats, it seems to me, is something that we must certainly come to. During my years of travel the evolution of the protection of large cities has developt, but it has not developt in small towns. The toilets are lockt thru large cities but not thru small towns. The risk might be obviated by a sign "Use toilet only when train is in motion." I think signs are educativ. I saw a sign in London once which read, "Kindly leave this room as you would like to find it." I have had it used in hospitals and playgrounds. It is a good suggestion to people.

With reference to the transportation of cases of typhoid, I heard an experience last year of two friends who went to the Yosemite Valley. A young man was brought down ill with typhoid in the baggage car. One of the friends was a trained nurse, the other a physician. They divided the night between them. There was absolutely nothing possible for the patient's comfort. He was controlled and watcht, but no convenience for his comfort was pro-

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vided. At the Yosemite end of the trip, they were supposed to have provided a receptacle for defecation and means for washing the nurse's hands after handling the boy. In such a rough trip as that is, along the Merced River, such a receptacle could be easily upset in the freight car and might mean a soiling of the car. I do not see why a stationary toilet could not be put into such a car and fastened to the floor. The nurse should have a sack for linen and supplies, and another sack where she could throw paper to be destroyed and burned.

In California we need emphasis on the fly proposition. In the public schools of the eastern cities they train the children to hunt for flies and have a fly day. I have a young visitor from the East who gets a cent for each fly he kills in his mother's house. If he started to find them in my house it would be very expensiv. I think the flies are more common in some districts here in the city than in others. That boy saw far more flies than I did. The public school fly day has trained him to see flies.

Dr. George E. Ebright, San Francisco:

The paper of Dr. Sawyer invites discussion of the very broad subject of contamination of drinking water. The contamination from railroads going over water sheds is only a part of the total cause of sewage contamination—the others comprise country hotels, farms, villages, camps, hunters, etc. However, the amount of contamination from railroads is sufficiently great to make it desirable that it should be removed. Probably the best solution lies in retaining tanks for train sewerage to be emptied at intervals. No doubt public health officials should consider more than has been done in the past the esthetic problem involved.

Dr. R. W. Corwin, Pueblo, Colo.:

In this connection I should like to say that a few days ago a man came to my office and askt me to tell him what to do for his trouble. I found his body thickly broken out with a loathsome disease. I askt him what sort of work he did and he said he was a pastry cook in a hotel. This certainly is distressing. Something should be done to overcome exposures of this nature.

Dr. C. W. Hopkins, Chicago:

I have often wondered what excuse the average human being has to live. It has been said that this world is a dangerous place in which to live and very few of us ever get out of it alive. It seems to be one pursuit by bugs and germs, and I guess the best we can do is to try to keep out of their way. Sometime ago I read of a troop of trained fleas that had developt so much temperament that they refused to travel unless they had their private dog. After hearing these papers it is to be regretted that all fleas have not the same temperament.

Regarding the sanitation of the railroad systems; I wish to say that most of the best railroads to-day have a sanitarian who is paid a yearly salary,

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and who gives his entire time to inspection of yards, toilets, depots, to looking after the water supply furnisht the passenger and the employe, the source of the ice supply and as to how the ice is handled. It has been found that this service has proven a valuable investment in many ways. The timely correction of some undesirable situation has saved many a dollar and has proven a great benefit from the humanitarian standpoint as well.

We are trying to teach employes, as well as passengers, correct sanitary and hygienic habits. The general trend all along the line is toward better education.

The best railroads are examining every employe who has anything to do with the preparation or handling of food. The dining car waiter, the chef, and all assistants are examined periodically for any transmissible disease and are taken out of the service the very instant such disease is discovered. It would therefore appear that the railroads are doing all in their power toward the prevention of disease and sickness, and are working for the general betterment of the human race, regardless of what it costs in dollars and cents.

Dr. Woods Hutchinson:

I think we have all been interested and instructed by these papers, which are very decidedly typical of one of the foremost and most vital questions we have to do with. We have had an illustration of how our point of view has changed within a few years. One of our learned brothers, a shining light in the world of law, recently stated that the law does not concern itself with trifles. We are glad and proud to state that the medical profession does concern itself with trifles and thus safeguards the public health. A few years ago it would have been lookt upon as an absurdity that an individual who presents himself as a passenger should be questioned as to whether he was a carrier of some insect or microscopic bug.

You are familiar with the case of "Typhoid Mary" in my city. She was a woman employed as a cook and has been traced as the cause of something like six epidemics of typhoid with eighty or ninety cases and seven or eight deaths. She had to be taken in charge and is now permanently incarcerated where she can no longer scatter the disease by uncleanliness thruout the community in the way she insisted upon doing.

As to the way mosquitoes can be carried from long distances, in New York City we suffer, of course, from the long distance Jersey mosquitoes, the celebrated forty-mile flier. They are brought by the wind. The mosquito usually stays close at home, but this one goes a long way from home. It does not, however, carry malaria. At times we have suffered from the ordinary fresh water mosquito in New York. We could not account for it until we examined the cisterns on top of the big buildings where water was kept in case of fire. The eggs of the mosquito came down thru the pipes in the croton water, hatcht in those cisterns and scattered all over the city. By screening those cisterns we were able to get rid of them.

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The question of keeping control of insects is of enormous importance. They are bad, but we are the real Ethiopian in the wood pile. They cannot do any damage until they have bitten one of our human family and become infected. A man is known by the bugs he keeps. The fly and the yellow fever mosquito are two species of most dangerous breed in and around and about the human habitation. But if we keep our own door yards clear and protect the insects from becoming infected by diseased human beings we have a sure method of protection.

Dr. Sawyer, closing:

In my paper I may have given the impression that I felt that the train and steamboats were places where the carrier was peculiarly dangerous. I believe that on the train the people who prepare our food are better supervised than in the average restaurant which we patronize off the train. When it comes to preventing carriers from being present among passengers, I feel that but little can be done on the train and steamboat, and that our fault is that we have so few full-time local health officers thruout the country to reduce communicable disease and control carriers at home. Until we have better public health service and reduce our local typhoid rates to such a point that there will be few travelers who are affected, there will continue to be a certain amount of danger from carriers on steamboats and trains.

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THE RELATIONSHIP OF COMPENSATION ACTS TO INTERSTATE COMMERCE.

By CHRISTOPHER M. BRADLEY, A.B., LL.B., Counsel to the Industrial Accident Commission of the State of California, San Francisco.

The legislature of the State of Washington enacting a compulsory compensation law, in 1911, made this declaration in Section 1 of the law:

> The common law system covering the remedy of workmen against employers for injuries received in hazardous work is inconsistent with modern industrial conditions. In practice it proves to be economically unwise and unfair. Its administration has produced the result that little of the cost to the employer has reached the workman and that little at large expense to the public. The remedy of the workman has been uncertain, slow, and inadequate. Injuries in such work, formerly occasional, have become frequent and inevitable. The welfare of the state depends upon its industries, and even more upon the welfare of its wage workers.

This is a legislativ epitome of the reports of all the legislativ commissions—some thirty in number—that have investigated the subject. This includes the National Commission, known as the Sutherland Commission, which investigated the subject with reference to common carriers engaged in interstate commerce, making its report to President Taft in 1912. Twenty-five states have enacted compensation legislation in varying forms as a result of these investigations and reports. Tho Congress has not yet enacted the statute proposed by the Sutherland Commission, but it is to be hoped that thoro-going legislation will be enacted at the next session.

In its primary aspect "compensation" is a name; it is nothing more than the name of a remedy; it is commonly called "workmen's compensation." This is quite a misnomer. It is no more workmen's compensation than it is employers' compensation, or public compensation. It is not compensation at all in the first view of the enactments establishing the principle, but it is relief. It is designed to ameliorate the unsatisfactory and unwholesome conditions of which so much complaint has been made,—to relieve the courts, the employer, the employee and

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the public. It is designed to distribute both burdens and benefits. In practical operation experience has demonstrated that it works such results.

Under compensation there is an equalization of burdens and benefits between the immediate parties; while the employer is made liable, in all proper cases of accident, for a known, definit and limited amount he is relieved from the speculativ, indefinit and unlimited liability which existed in some cases; and while the employe surrenders a present doubtful, expensiv and, therefore, unavailable right of recovery of unlimited damages in some cases, he receives in exchange a sure, expeditious, inexpensiv and available remedy in all cases. In addition to the distribution of burdens and benefits as between the immediate parties, there is a second kind of distribution of the burden, that is, the indemnity payable is chargeable to the industry in which the injury or death is suffered, and the cost of the indemnity is carried over into the price of the product or the service, as the case may be. Furthermore, the burdens may be even more widely distributed, in practice, by insurance coverage, which is the ideal condition with reference to all compensation liability.

Compensation is not damages, nor meant in principle to be partial damages, nor is it based upon the idea of tort nor meant to be a reparation for a wrong. In principle it is the payment or advance, in the first instance, of the employer's share of a common loss in a common undertaking. It has, therefore, none of the injustice of the present law, by which the employer, without real fault, is often held liable in full damage just as if he had done a wrong.

The principal objects to be attained in a compensation act are:

1. To encourage the introduction, maintenance and use of preventiv devices and preventiv discipline so as to reduce the number of accidents to the reducible minimum.

2. To furnish certain, prompt and reasonable compensation, limited in amounts and time, to the injured employe, which should consist of

(*a*) Medical and surgical treatment and adequate hospital service immediately after the injury and for a limited time there-

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after, to cure and relieve from the effects of such injury and to restore the sufferer to the ranks of producing labor.

(*b*) Such limited compensation or financial aid to the injured workman, based upon his wage income, as will maintain him and those dependent upon him above want until he recovers from his injury or can develop a self-sustaining capacity.

(*c*) In the event the accident results in death, then such limited aid to those dependent upon him for support as will keep them above want until they can develop a self-sustaining capacity.

Treating compensation, then, as a system of relief, it is here insisted that the prime component of such a system must be provision for adequate safety measures and for the enforcement of them, for the reason that prevention is to be emphasized rather than cure or financial assistance to the sufferer, in the same degree that emphasis is placed upon preventiv measures in the field of medicine and surgery to guard against disease and physical impairment.

Much has already been accomplisht in the safety field, both by legislation and by the initiativ of railroads themselves. Congress has enacted a Safety Appliances Act, the Hours of Labor Act, and other fragmentary legislation, and has made provision for a system of inspection, under the jurisdiction of the Interstate Commerce Commission, to secure enforcement. While these measures have brought some relief, and while the railroads have co-operated to some extent, the official reports disclose that the system of inspection is wholly inadequate and that the co-operation of the carriers is not general in the observation of statutory safety requirements. In this situation it would seem advisable, in drafting a Federal compensation law for the government of carriers of interstate commerce, to incorporate provisions for a safety department and to centralize in an administrativ body all the necessary powers of safety regulation and enforcement.

Closely allied to adequate provision for safety measures and their enforcement, and coming second for emphasis in formulating a Federal statute, is the provision for medical and surgical benefits for the relief of the injured, to accomplish the result of

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restoring them to efficiency with the least loss of time and with the least physical impairment as the result of injury. The magnitude of the financial outlay for medical and surgical treatment and hospital service, as an item of compensation, is not generally appreciated. Of the total money cost of compensation, an average of approximately 40 per cent. is expended under this head. When it is understood that charges for this item are made upon a much reduced scale, some estimate can be made of the volume, the value, and the importance of the service.

The third division of a compensation system is usually the one kept most prominently in view in all discussions of compensation measures. It is the provision of financial benefits based upon the percentage of earnings, to be paid in installments, as wages are paid, for the purpose of carrying the disabled employe and his dependents over a period of adversity. The relief accomplisht under this head is of the greatest sociologic and economic value. It places the money quickly and directly, without diminution, where it will give the needed relief. It dispenses with damage litigation. It stops the drain upon public and private charity. It tends most strongly to the elimination of hostility between the employing railroad and its employes, and sustains an even standard of living and independence, making for the restoration of activ efficiency in the field of labor, or accommodation to a new line of endeavor, for which the disabled man may be fitted.

Official statistics, compiled by the Interstate Commerce Commission for the year ending June 30, 1913, disclose that in the year immediately preceding there were 3,715 railroad employes killed by accident and 171,417 employes who suffered accidental injury in the course of their employment. The record for the succeeding year, 1914, shows 3,259 killed and 165,212 injured,—a slight reduction. Other reliable statistics inform us that during the year 1913, industrial accidents in the whole field of industry in the United States caused the death of an employe every fifteen minutes and the injury of an employe every sixteen seconds, based upon a day of twenty-four hours, including Sundays and holidays. Applied mathematics will demonstrate how great is the

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proportion of railroad industrial accidents to all other accidents. The figures at hand cannot fail to strike the conscience of civilized society as making a situation calling for relief. It is a continuous appalling disaster.

Since the report of the Sutherland Commission, in 1912, it can no longer be doubted that there is to be found in the realm of interstate commerce the most appropriate field for the operation of a compensation law. At the present time there is no proper relationship between state compensation acts and interstate commerce. Only this much can be said: there are some twenty-five state compensation acts; there is a tremendous amount of interstate commerce, both by rail and by water, and the frequency of accidental death and accidental injury has already been indicated. No interstate commerce by rail is toucht or affected by state compensation acts, for the simple reason that the power to regulate interstate commerce is constitutionally vested in the Congress, and tho the Congress has entered the field of regulation of the relation of employer and employe with reference to personal injury cases, by enacting the statute of April 26, 1906, it has never enacted a compensation act covering this status. The law is a negligence law, but it is sufficient to exclude the operation of the state laws in the larger classes of cases, that is, where the injury is suffered by an employe employed in interstate commerce.

The state laws can operate only where the employe is not employed in interstate commerce. Nearly all of the state statutes contain an express disclaimer of jurisdiction over interstate commerce cases. Railroads engaged in interstate commerce have taken the position that the state laws cannot be applicable in any case where the railroad is engaged at all in interstate commerce, for the reason that Congress has entered the field of regulation and excludes the state law as to all cases where there is the least color of interstate commerce. The opposite view is that the facts of the occurrence are to be tested with reference to the specific act and the specific service being rendered by the employe at the time he is injured or killed, that is, whether the act of the employe, himself, is in connection with interstate commerce or intrastate commerce.

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There lies at the threshold, then, in any case, this question: Was the employe engaged in interstate or intrastate commerce? If he was engaged in interstate commerce, his rights and the obligations of the railroad company must be adjudicated in court under the Federal negligence law. If he was engaged in intrastate commerce, his rights and the obligation of the railroad are to be determined in view of the provisions of the compensation statute in the jurisdiction where the accident occurs. The line of cleavage between interstate and intrastate commerce is a very thin one. This may be best shown by concrete cases.

The Supreme Court of the United States has decided that a laborer who was carrying a box of metal bolts to be used in the repair of a railroad bridge, and who was struck and killed by a train when he was some distance from the bridge, on his way to the bridge, was performing a service in interstate commerce. The same court has held that the fireman of a switch engine, used to handle interstate and intrastate commerce indiscriminately in the railroad yards, and who lost his life by collision in the yards, while the engine was drawing a train of cars containing only intrastate freight, was engaged in intrastate commerce, even tho the switch engine was to be used immediately afterward to haul interstate cars. There cannot be the least doubt that if there had been one car freighted with interstate commerce in the train which was being handled when the fireman lost his life, the court would have held that the deceased fireman was engaged in interstate commerce.

In a case now pending in the Supreme Court of California, the Industrial Accident Commission of this state awarded a death benefit to the widow of a round-house foreman, who lost his life while he was engaged in repairing a switch engine in the railroad company's round-house. The engine had been withdrawn from service for repair three days before the accident and was not restored to service until three days after the accident. When in use the engine was used indiscriminately for handling both interstate and intrastate commerce. The theory of the decision was, *first*, that the employe was not engaged in either kind of commerce, because the engine had been detacht from

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service in any kind of commerce; and, *second*, that the service being performed by the employe at the exact time he lost his life was wholly detacht from interstate commerce. The railroad company has taken the case to the Supreme Court on the theory that all its employes are employed in interstate commerce. You may decide this case.

These illustrations will show how great is the confusion when it is understood that each case must be decided upon its own facts. After so many disagreements between the Federal courts and the state courts as to the proper criterion to determine jurisdiction, it is an adventure to attempt to deduce a workable rule for all cases. However, it is believed that the Congress has only covered the field in cases where the injury or death occurs, (1) while the carrier is engaged in using the particular instrumentality in a specific act of interstate commerce, and (2) while the employe is performing a specific service in interstate commerce. In other words, the status of the parties to determine jurisdiction is not defined upon general considerations, but upon specific considerations. As to employes suffering injury or death while repairing instrumentalities, it is thought that these are the proper tests:

(1) Did the instrumentality remain in use in interstate commerce?

(2) Was the instrumentality at the specific time, place and circumstance of the injury, then being used in interstate commerce?

Accordingly, as this preliminary question is determined, you have a case to be decided under either the terms of the Federal negligence statute or any one of the state compensation acts, depending upon the location of the accident. The confusion is more apparent when you understand that the measure of liability is not the same, that the procedure is not the same, and that the measure of any of the rights is not the same under any two of the state compensation acts. Neither the railroads nor the employes know where to turn for relief or for protection. This situation would be clarified to a great extent by the enactment of a national compensation act covering all employes employed by carriers engaged in interstate commerce, limited only according to constitutional requirements as laid down by the

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Supreme Court of the United States. While there would remain the preliminary question in a large class of cases, liability would be fixt and known within definit limits, much more clearly defined, and under the same kind of a law. It would also eliminate much of the competition for jurisdiction.

It is to be hoped, also, that uniform compensation legislation will be evolved out of the present chaos of state statutes when the system of compensation, as a system of relief, has been tested and a larger experience accumulated. Should this be brought about so that the state acts generally, and the national act specifically, covering employes engaged in interstate commerce, are nearly parallel in terms, we would have a solution in a measurable degree of a most perplexing set of problems.

Limited time forcloses exhaustiv discussion of more than a few of the compensation problems in the field of interstate commerce. The conflict between state laws and the admiralty law involving the intricate problems of conflict of laws, Federal with state, and state with state, and on navigable interstate and intrastate waters, will suggest to you how far you may travel, both at home and abroad.

There is no act of Congress covering maritim personal injury cases, and it is thought there is room for the operation of state statutes to a limited extent, unless it shall be finally determined that the constitutional grant of exclusiv jurisdiction over maritim matters to the Federal courts will operate to exclude the jurisdiction of the states even over navigable waters wholly within state boundaries. Numerous of these questions are now pending in courts of last resort. The issues are made up in many forms, that is, with reference to accidents occurring on the high seas, on navigable waters within the state, and in the home port of the ship, in ports of foreign states, and in the ports of foreign countries. In the absence of legislation by Congress, it would seem that jurisdictional rights, and, therefore, substantiv rights, must be workt out by judicial decision.

The most pressing problem for solution is that with reference to interstate commerce by rail, and I would respectfully suggest it to be the duty of organizations in the sociologic field to give

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careful and studied attention to the problems which I have been able to give here only passing consideration, with a view to the exercise of proper influence for the enactment of adequate compensation legislation by the Congress in the field of interstate commerce by rail.

DISCUSSION.

Dr. Woods Hutchinson, New York:

This interesting paper of Mr. Bradley's deals with an attempt, and a successful one, to cure one of the most outrageous injustices and unfairnesses in our industrial system. In an investigation made by the Associated Charities in New York, some eight or nine years ago, of some two thousand cases of death in industries, it was shown that the average amount paid and reaching the workman's family was about three hundred dollars. Another investigation conducted by another organization more recently showed that the average damage paid for a life taken in industry was one hundred and seventy-five dollars. When conditions reach that pitch, even the law sees that something has to be done. However, I am not sure that with the confusion and overlapping of state law, interstate law and Federal law, we would not have been better off to allow every case to be determined on its own merits by a committee of the neighbors, with no appeal from their decisions.

Mr. Bradley, closing:

There is little to add to what has been written. The problem under discussion is a very live one at the present time. The report transmitted to President Taft in 1912 received from him, in his message to Congress, as strong a recommendation as was ever placed on record, I think, by a President of the United States.

I am told that the defeat of the legislation proposed by the National Commission was effected by one or two of the railroad men's labor organizations. That is not attributing to those organizations any improper motiv because my further information is that such activity as they displayed against the legislation was prompted by personal injury lawyers who had benefited in a great many personal injury cases against the railroads. That very system has been encouraged and nourisht by the present "negligence" statute upon the Federal statute book, because that statute takes away certain common law defenses and makes it easier for the employe who recovers anything to recover very substantial damages, out of which liberal fees are paid. It is plain that there will be strong opposition again to the enactment of a Federal compensation law. However, I think that opposition can be intelligently combatted by such organizations as this. The railroad men themselves have come to understand their mistake in fighting against this sort of legislation, and I am strongly of the opinion that at the next session of Congress they will be present, asking for a Federal law to clear up some, at least, of this confusion.

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THE HEALTH PROTECTION OF THE SAILOR IN THE MERCHANT MARINE.

By RELL M. WOODWARD, M.D., Surgeon, U. S. Public Health Service, San Francisco.

The term "Merchant Marine" includes all registered, licensed or enrolled vessels sailing under the American flag. It does not include vessels of the U. S. Navy. There are about 175,000 men in the Merchant Marine of the United States and from these men the U. S. Marine Hospitals draw their patients.

The branch of the United States Government which cares for the sailors of the Merchant Marine when sick or disabled is under the control of the Treasury Department, and was originally organized in 1798 under the name of the Marine Hospital Service. Later the name was changed to Public Health and Marine Hospital Service; and still later to the U. S. Public Health Service. The Marine Hospitals remain under its control. When the Service was originally organized there was an association between the sailors of the Merchant Marine and those of the U. S. Navy, both classes of cases being admitted to the Marine Hospitals. In about 1827 this affiliation was severed and each of the Services erected its own hospitals.

United States Marine Hospitals are located at virtually all of the chief cities on the Atlantic, Pacific and Gulf coasts, on the chain of Great Lakes and on the Ohio and Mississippi rivers. At other points where there is sufficient work to justify such action a commissioned officer of the Service is detailed and a contract is entered into with some local hospital to take care of the patients who apply. At still smaller places local physicians are appointed as Acting Assistant Surgeons to look after the work of the Service; and at any point where a Collector of Customs is located he may make arrangements for the treatment by private physicians of any merchant seaman requiring same. Provisions have also been made for the care of seamen of the Merchant Marine in Alaska, Hawaii, the Philippines and Porto Rico. There is no reason, therefore, why a sailor, except when

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at sea, should be unable to secure medical attendance. There is no charge for the treatment of these patients.

The Service treats annually something over 50,000 patients. There is a popular idea that the majority of such cases are due to vicious habits. This is a decidedly overdrawn picture. It is not my desire to paint the sailor-man as a saint. He is not that, but some allowance should be made for his mode of life. He has no settled home, and when ashore with money in his pocket is surrounded by many temptations. Venereal diseases constitute about twenty-one per cent. of the patients treated by the Service, a great many more such cases being treated as out-patients than as hospital patients. Alcoholism requiring physical restraint is very rare in Marine Hospitals. The other seventy-nine per cent. of the patients include almost every disease that can occur in a man.

The tubercular patients of the Service are cared for in a sanatorium at Fort Stanton, New Mexico, which has an altitude of 6000 feet. The reservation covers several square miles of range land, but the station itself is located at a point most convenient to the railroad. During the days of the Indian uprisings numerous Army stations were located in the west and southwest. After this danger was past many of these posts were abandoned and the troops concentrated in more populous centers. The reservations remained the property of the United States Government, and it was one of these that was turned over to the U. S. Public Health Service for use as a Tuberculosis Sanatorium. It still retains its former name of Fort Stanton, New Mexico. At this sanitorium the treatment consists largely of life in the open air. Bed cases and all patients for a few days after arrival at the station are treated in the hospital, but all other cases are treated in tent-houses erected on the reservation. Various forms of medicinal and other treatment have been tried from time to time but they have not seemed to accomplish results better than the ordinary open-air treatment. During the past few years this station has averaged about 190 patients under treatment. The station has its own dairy and beef herd. It also has a garden where part of the station subsistence is raised. In transfer-

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ring patients from various Marine Hospitals to the sanitorium at Fort Stanton rigid precautions are taken to prevent the spread of the disease to fellow-travelers. For instance, each patient is given a closed sputum cup of light material and is also furnished a bottle of antiseptic solution, a portion of which he is instructed to keep constantly in the cup and with which he is directed to wash out the cup before emptying same into the water closet. He is cautioned particularly, in writing, about expectorating anywhere about the trains, stations or hotels en route. He is given a drinking cup for his exclusive use and is warned not to use those on the trains, if same are carried by the trains. Many patients feel the sudden change in going to this high elevation and for that reason all are confined to the hospital for at least four days upon arrival, in order that they may become accustomed to their new surroundings.

Marine Hospitals take care of the cases requiring hospital treatment. The out-patient offices, usually located in the Custom House, treat more patients than the hospitals. At San Francisco during the last fiscal year 1360 patients were treated in the hospital, while the out-patient office, located in the Appraisers' Building, treated 2372 patients.

In addition to the sailors of the Merchant Marine the following Government Services are treated in Marine Hospitals, namely: Coast Guard, Light House Service, Mississippi River Commission, Engineer Corps, U. S. Army, Life Saving Service, and Coast and Geodetic Survey.

Sailors from ships under foreign flags are treated in Marine Hospitals at the request of their respective Consuls, and nominal reimbursement is made by the foreign governments to the U. S. Government for such treatment.

The reports for the last few years will show a great increase in the number of cases of syphilis treated. This does not mean that more cases of the disease are actually occurring, but that those who have had evidence of the disease at any time in their lives are now applying for treatment by "606." It is considered that the purchase of this remedy is a wise expenditure of the appropriation, as it protects the general public as well as the patients

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themselves. Officers of the Service endeavor to exert a moral influence by advising early and vigorous treatment for venereal diseases and by warning patients against evil associates.

One of the most frequent surgical affections treated in Marine Hospitals is hernia. Years ago these patients were furnisht trusses, and even at the present time trusses are occasionally furnisht to patients who are not in physical condition to undergo operation, or who for any reason decline surgical treatment. The report for the last fiscal year shows 220 operations for hernia in the Service.

In a general way, it may be stated that the merchant sailor in order to be eligible for treatment in Marine Hospitals must bring a certificate from the captain, owner, or agent of the vessel, showing that he has sailed upon said vessel for a period of two months immediately preceding his application for admission to hospital. This requirement is subject to numerous exceptions, and any person injured or taken ill on duty is treated without regard to length of service. Whenever a reasonable doubt exists as to the applicant's eligibility to treatment under the laws and regulations he is given the benefit of the doubt.

It is difficult to compare statistics of results in Marine Hospitals with those in other hospitals. The conservatism that marks Government work is shown in recording the results. Four entries are used, namely: "Recovered, Improved, Not Improved, Died." No man is discharged "Recovered" until his symptoms have virtually disappeared and he is able to resume his vocation. In syphilis, for instance, no matter how fully the evidences of the disease may have been removed, the case is only markt "Improved." At the Tuberculosis Sanatorium in New Mexico the favorable cases are discharged "Apparently Cured," or "Disease Arrested." Experience with relapses has shown the unwisdom of recording any of these cases as "Recovered."

The building of the Panama Canal will increase the work of the Marine Hospitals on the Pacific Coast. Efforts are being constantly made in Congress to build up the Merchant Marine and increase the number of vessels sailing under the American flag.

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If these efforts succeed the work of the Service will be increast in proportion.

In all contracts for food, medicines, etc., it is always stipulated that supplies shall be of the best quality, and any that do not meet this requirement are promptly rejected.

A few years ago new Marine Hospitals were built in Buffalo, N. Y., Pittsburgh, Pa., and Savannah, Ga. They are modern in every respect, and well equipt. It was formerly customary to build Marine Hospitals in warm climates on the pavilion plan, the wards being frame and spread out like a fan; but on account of the extensive repairs necessary, the modern tendency is to build reinforced concrete block hospitals. The general equipment is similar to that in all modern hospitals, and an endeavor is made to keep pace with the constant improvement along these lines. A Bill for a $500,000.00 Marine Hospital in San Francisco past the Senate during the last Congress, but did not come up for consideration in the House. We hope it will be presented to the incoming Congress.

There is at present in the Marine Hospital at San Francisco a rather celebrated typhoid carrier. This patient was originally treated in the hospital for typhoid fever and was discharged recovered. He was apparently responsible for the outbreak of typhoid fever on board a vessel upon which he had shipt, and the detection of the case is due to the earnest work of Dr. W. A. Sawyer, of the University of California. The patient was returned to the Marine Hospital and was treated with autogenous vaccines. Repeated examination of his stools for a period of many months failed to show typhoid bacilli, and he was again discharged as recovered. He shipt aboard a vessel and very promptly three cases of typhoid fever developt. He was again apprehended and returned to the hospital, when, with his consent, his gall bladder was removed, this being the accepted treatment at that time. He made a good recovery from the operation and is in excellent physical condition. It is a curious fact that a thoro examination of the contents of the gall bladder, made by Dr. Currie in the Federal Laboratory, San Francisco, revealed several organisms, but did not show any typhoid bacilli.

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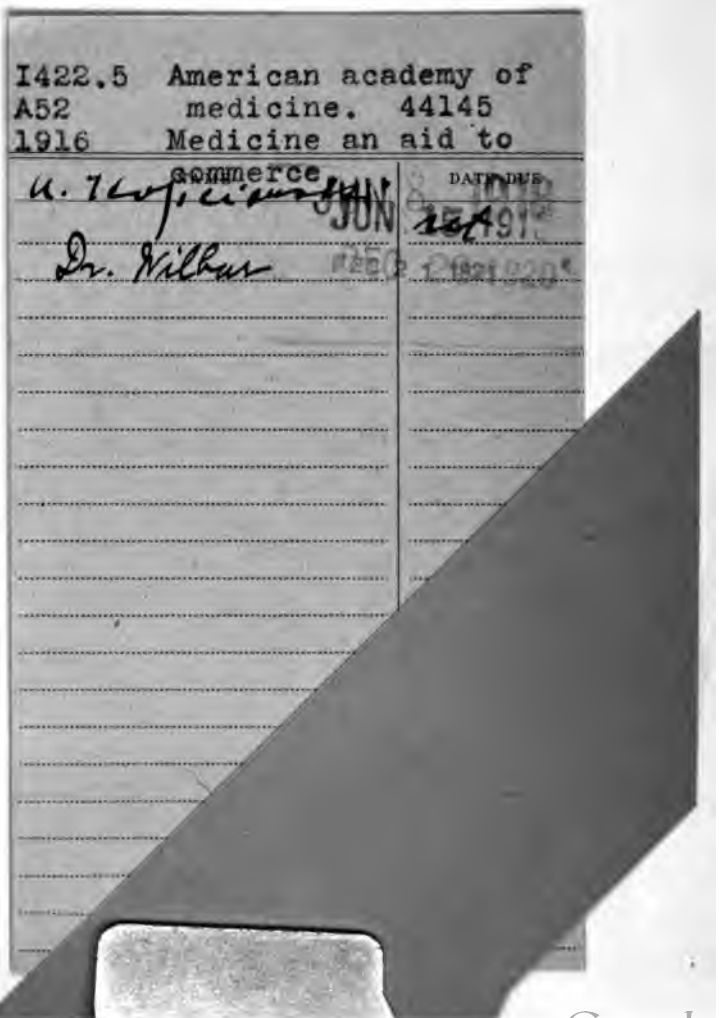

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